Charting the Immersive Self: A Scoping Review of Immersive Personal Visualisation

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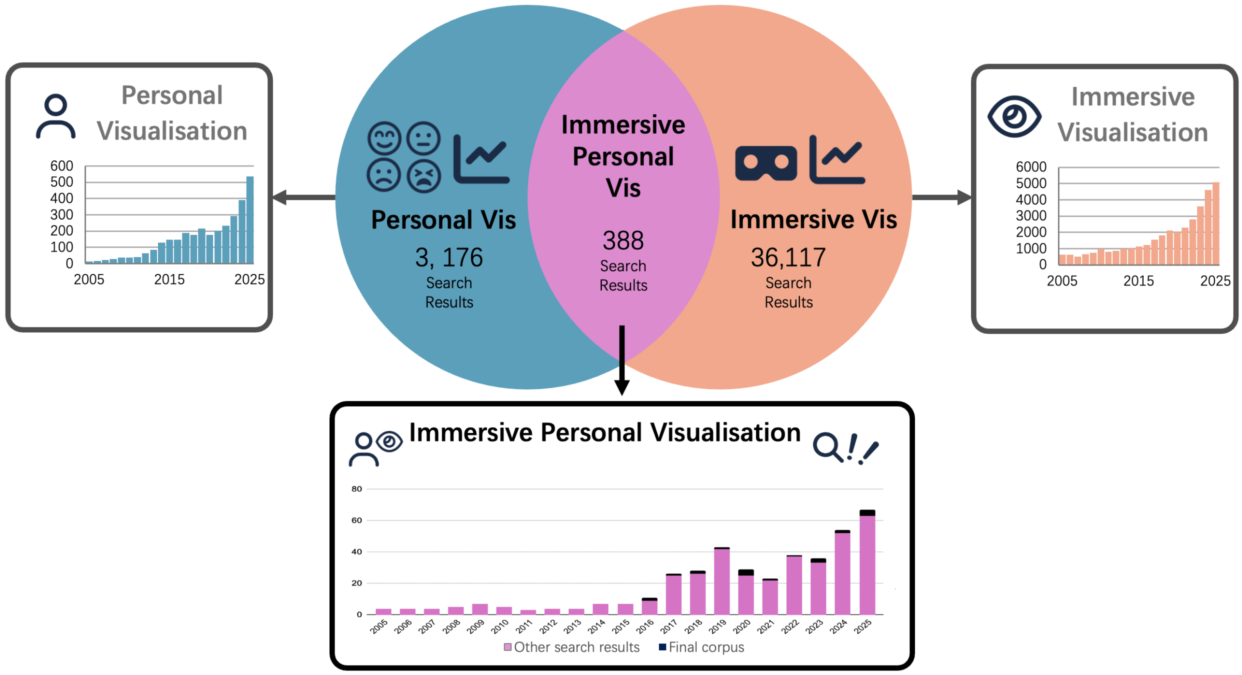

Figure 1: Research trends at the intersection of personal visualisation and immersive visualisation. From 2005 to 2025, interest in personal and immersive visualisations has grown steadily. Yet, immersive personal visualisation remains notably rare, pointing to a gap that this survey begins to explore.

Abstract—Visualisation is increasingly used to help people explore and reflect on their personal data. However, most work on personal visualisation relies on screen-based solutions that can be hard to integrate into real-world experiences. Immersive visualisation technologies offer solutions to these challenges. In this paper we explore how combining immersive approaches with personal visualisation presents new opportunities for engaging with personal data through situated, affective, and experiential interaction. We examine this emergent space of Immersive Personal Visualisation through a scoping review of 21 studies. We provide a characterisation of existing work in this domain with our analysis revealing five structural trends: an emphasis on late-stage reflective engagement in the personal informatics lifecycle; a prevalence for affective forms of data engagement; a focus on real-time data experiences; widespread use of abstract and metaphorical visual encoding; and a tendency for users to remain passive viewers in implemented systems. Building on these findings, we expose key opportunities for advancing immersive personal visualisation, highlighting the role of interaction design, interpretable visualisation, and lifecycle-spanning engagement. We conclude by outlining a future research agenda for advancing immersive personal visualisation and argue that, as XR technologies become more accessible and pervasive, this emerging space has the potential to reshape how people access, understand, and live with their data.

Index Terms—Personal informatics, visualisation, extended reality, immersive personal visualisation

1 Introduction

Personal data plays an increasingly important role in shaping how people reflect, remember, and make sense of their daily lives [13,19,21]. From sleep and stress, to memories and moods, these traces of lived experiences are more than just numerical records. They carry personal, contextual, and often emotional significance. However, meaningful and prolonged interaction with this data remains a difficult task [32,54].

The field of personal informatics focuses on this challenge predominantly by building tools and frameworks for self-tracking, reflection, behaviour change, and personal insight, helping individuals to monitor behaviours, manage health, and explore identity [19]. Much of this work has focused on highly engaged users such as 'quantified self-ers' [48] and relies on a significant level of manual input, typically emphasising goal-oriented use and analytical interpretation. Whilst effective for these users, these approaches often provide limited support for emotional connection, contextual richness, and long-term relevance,

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constraining deeper engagement with personal data [54, 65].

Personal Visualisation (PV) has emerged as a subfield of personal informatics and data visualisation research which explores how personal data can be represented visually [27]. Research in this area has acknowledged the unique contexts of users engaging with their personal data, however, the tools available remain limited, often presenting personal data as isolated metrics, static graphs, or simple timelines. These approaches can require significant manual input and introduce a layer of friction between the user and their data, flattening complex experiences and limiting users' opportunities for deeper reflection, emotional connection, or situated understanding [65]. In fact, many users eventually abandon tracking and visualising their personal data, citing low motivation, fragmented interfaces, or difficulty making sense of data in ways that resonate with their lived experience [21].

Despite work examining how users can engage with data in their 'everyday' lives emphasising the importance of users *experiencing* and *feeling* their data [65] only limited PV research has explored more situated and experiential forms of engagement – such as alternative, interactive representations [78], expressive approaches [18], or physically situated displays [10]. Instead, most systems continue to rely on screen-based experiences, which limits the kind of connections users can have with their data [19]. This highlights a persistent challenge: *how to support meaningful, low-friction engagement with personal data in ways that can be integrated into everyday life*.

Extended reality, including virtual, augmented, and mixed reality, represents new opportunities for how personal data can be experienced [8]. In particular, the expanding field of **Immersive Visualisation** (IV) has the ability to situate data in space, foster embodied interaction, and engage multiple sensory modalities [50]. However, much of the existing IV research has focused heavily on analytical or novel data presentation challenges with expert users, often in controlled settings [38, 87]. As a result, relatively little work has explored how these immersive approaches might support engagement with personal data and address the challenges identified in Personal Visualisation.

The affordances of IV suggest that this field has the potential to make personal data more accessible by expanding awareness and learning [33]; more tangible by fostering comprehension, agency, and novelty; [30] and more expressive through personalisation and context [82]. By moving beyond screen-based visualisations, IV offers new avenues for self-reflection and personal connection with data through experiences that foster higher levels of engagement and affect [40] as well as making it possible to situate data in specific contexts [60].

Despite their promise, IV systems currently remain constrained by technical and practical limitations. Existing implementations often rely on specialised hardware such as bulky, conspicuous headsets, limiting their accessibility and long-term use. However, ongoing advances in XR technologies are gradually reducing these barriers, making immersive experiences more portable, ubiquitous, and adaptable to real-world contexts. As XR devices become more pervasive and accessible, the intersection of PV and IV – which we term ***Immersive Personal Visualisation*** (IPV) – has the potential to transform how people engage with their personal data.

We frame IPV as a specialised perspective within immersive visualisation that focuses on the unique challenges of personal data. Whilst IPV shares many facets of IV through hardware and visualisation primitives, its distinction is the field's central focus on data that is directly related to the end users of the systems. Personal data like this is often affectively charged, embedded in everyday routines, memories, identities and social relationships. As a result, the design problems for IPV shift away from the traditional IV focus of supporting analytical performance on external datasets, towards supporting personal meaning-making, reflection, expression, agency, and sustained engagement with one's own data. This perspective motivates our focused scoping review of IPV as a distinct space at the intersection of IV and PV.

At this intersection, personal data can become something to enter, navigate, and feel, transforming static representations into interactive, immersive experiences. By surfacing data in context and supporting embodied interaction, IPV has the potential to reduce the friction associated with traditional personal informatics systems and broaden engagement beyond highly motivated or technically experienced users. In doing so, IPV opens possibilities for supporting interaction with personal data across the full lifecycle of personal data [21, 42] – from its creation, through to reflection, and future action.

Consequently, this paper asks: **What is the state of the art in immersive personal data visualisation?** To address this, we conducted a scoping review [3] of 21 studies sitting at the nascent intersection of Immersive Personal Visualisation. Our review aims to characterise existing approaches, identify emerging patterns, and highlight opportunities to inform the future development of this field. Fig. 1 shows a rapid growth in the number of search results for work in the PV and IV spaces over the last few years. Whilst a similar upwards trend can be seen in IPV, our further processing of these results (Sec. 3) shows that this still remains a relatively under-explored intersection. This scoping review is critically timed to help inform the direction and impact of future work in Immersive Personal Visualisation.

Through our review, we make two primary contributions. First, we provide a **characterisation** of existing IPV research by describing the 21 studies published in this space, identifying domains that researchers focus on, design strategies they use, and the technologies they utilise. This analysis also highlights how immersive approaches to personal data differ from traditional personal informatics systems. We outline 5 trends (Sec. 4.4) that emerge and examine how IPV work leverages the unique affordances of XR to balance faithful and abstract representations of data, deepen self-understanding through experiential engagement, and expand the expressive potential of personal data. Secondly, we propose a forward looking **research agenda** (Sec. 5) that highlights 5 specific opportunities directly related to the trends we observed. This research agenda outlines how future work in IPV can support more meaningful, interpretable, and sustained engagement with personal data as the available technologies continue to advance.

2 Related Work

2.1 Personal Informatics and Self-Tracking

Personal informatics systems help individuals collect and reflect on personal data to support self-awareness, behaviour change, and everyday decision-making [42]. As a foundational area in personal data research, personal informatics has introduced conceptual models such as the Stage-Based Model [42] and the Lived Informatics Model [21], which frame data engagement as a dynamic, context-dependent process shaped by shifting goals, routines, and life transitions. These models define a **data lifecycle** that describe how users *prepare*, *collect*, *integrate*, *reflect*, and ultimately *act* on their personal data. This work has laid the foundation for tools that move beyond automatic self-monitoring towards more contextualised and personally meaningful engagement.

Personal informatics systems have shown promise across domains such as physical activity, sleep, mood, and chronic illness management. However, a common issue across the data lifecycle is engagement. Users often struggle to overcome the friction associated with the manual burden of early stages of data management such as collection. Prior research has emphasised the barriers that users face including time commitment, the need for technical knowledge, as well as users' changing motivations for tracking [32, 47]. In many situations these barriers result in users lapsing from tracking or abandoning it all together [14, 20].

Existing systems have also historically emphasised instrumental goals and analytical tools designed to aid technical 'quantified self' users [13, 48]. Many of these tools emphasise the intended purpose of self-tracking as behavioural change [19]. However, work exploring how less technical users engage with their personal data has shown a desire for more reflective and curiosity driven engagement with personal data [16], whilst also emphasising the limited facility for interaction with their data and difficulties these users face engaging with traditional personal informatics tools [65].

These trends suggest that while Personal Informatics has established essential foundations for self-tracking and behaviour change, its emphasis on goals and metrics can limit emotional connection, creative expression, and sustained engagement. One area of focus for fostering engagement and reflection has been by leveraging data visualisation.

2.2 Personal Visualisation

Data visualisation transforms abstract information into visual forms that support interpretation, insight, and decision-making [74]. While traditionally rooted in scientific analysis and expert uses, visualisation is increasingly applied to personal contexts, helping individuals particularly address the *reflection* stage of the personal data lifecycle and to understand more about their health, behaviours, emotions, and identities [11]. This shift to personal contexts has fuelled growing interest in **personal visualisation** [27], which emphasises user-centred, self-authored designs that support everyday meaning-making.

Extending this foundation, researchers have explored how personal visualisations enable introspection and reflection. These systems help reveal behavioural trends, enhance emotional insight, and support long-term reflection. For instance, Huang et al. [28] developed an on-calendar tool that linked feedback data to daily routines, helping users identify and interpret behavioural patterns. Gouveia et al. demonstrated how temporal, locational, and social cues in Footprint Tracker [24] facilitated memory recall and emotional reflection. Loerakker et al. [45] found that subtle framing choices in screen time visualisations significantly shaped users' emotional responses, influencing self-compassion and rumination. These studies show that visual design not only impacts what people understand from their data, but also how they *feel* about it.

In parallel, inclusive visualisation research highlights how personal data can empower individuals historically excluded from data systems. Visualisation has supported representation and visibility for marginalised groups. For example, in accessibility contexts, researchers have shown how visualisations grounded in accessible design can support self-advocacy, therapeutic expression, and everyday autonomy [84], reflecting a broader shift towards embodied, affective, and narrative approaches that make data more approachable and expressive. Others have explored data comics and narrative visualisations to engage underrepresented audiences through metaphor, emotion, and storytelling [23]. These directions frame visualisation as a medium for inclusion, empowerment, and identity expression.

Although we highlighted some work that moves beyond analytical tracking, many personal visualisations remain focused on numerical driven representations [11]. Moreover, the majority of this work remains on traditional screen-based representations [19] such as mobile phones or physical displays. Moore et al.'s *Personal Informatics Analysis Gap* [54] describes how these representations struggle to engage users even when the data presented is health-critical.

In response, some research has explored more narrative and expressive forms of personal data engagement that move beyond traditional screens. Some work has developed physical representations that encapsulate personal tracking data which can facilitate reflection and reminiscence in the home [1, 34]. These kinds of artefacts promote emotional reflection, and socially situated engagement. Bressa et al. also emphasised the importance of *situated* personal data by utilising physical displays directly tied to the context they were recording data for in an attempt to reduce the friction observed in personal tracking.

These works illustrate the potential for exploring more immersive, affective, and context-sensitive approaches to personal data, an emerging space this review aims to map. One technique for facilitating these goals is extended reality and immersive technologies.

2.3 Immersive Visualisation

Extended reality, encompassing virtual, augmented, and mixed reality, offers new pathways for engaging with data through spatial, embodied, and multisensory interaction. **Immersive Visualisation** (IV) represents the combination of extended reality with visualisation research to move data representation beyond the confines of 2-dimensional screens.

IV offers several unique affordances beyond traditional approaches, including heightened levels of engagement and memorability, more natural and embodied interactions, and contextual embedding of data [73, 87]. The ability of IV to place a user directly into simulated scenes allows them to explore data through movement and leads to them feeling more connected and often reporting more emotional and affective responses [40]. These characteristics are especially promising for personal data contexts. In addition to immersing users in environments, IV can also be used to reduce friction for users in real-world scenarios. Existing work has examined how augmented reality solutions can provide more display space in work settings and reduce visual clutter and reliance on physical displays [60] – this could be leveraged in personal data contexts to reduce the burden users experience interacting with screen-based solutions.

Some work has looked more explicitly at the affective potential of IV approaches, investigating how extended reality representations of data can facilitate stronger responses from users to issues such as pollution [4] and even reduce implicit biases by immersing users in alternate perspectives [61]. People have rich emotional and contextual connections to their personal data, and these affordances of IV suggest that is well placed to facilitate engagement which moves beyond what is made possible in existing personal informatics research. Despite this, work in IV has focused on analytical tasks [87] and often on expert and specialist users engaging in controlled settings [73] with limited attention to personal data or more casual, everyday, interactions.

Nevertheless, immersive technologies still face barriers to widespread adoption and everyday usage [15], but hardware is becoming increasingly more commercially available through offerings such as the Meta Quest headset and Rayban[1] and Oakley's 'smart' glasses[2] which continue to broaden the potential audience of IV and the settings that can utilise it. Forward looking research suggests a future where augmented reality technologies particularly are pervasive and ubiquitous [7]. As immersive technologies continue to evolve, **Immersive Personal Visualisation** offers a compelling direction for reimagining how personal data is encountered, not as distant metrics, but as memorable, affective, and situated experiences. Our review maps this growing landscape to surface new opportunities for inclusive and reflective data engagement.

2.4 The Immersive Self: Integrating PV and IV

While prior surveys have explored PV and IV research, most have grounded their searches in either personal informatics (e.g. mapping self-tracking practices in personal informatics [20]) or extended reality (e.g. exploring device-centric applications in XR [41]) with little work to our knowledge explicitly addressing their intersection.

To better understand the scope and overlap of existing work, we conducted a targeted database search (Sec. 3.2) that returned several relevant survey papers. Some of this work surveyed PV and IV work and we summarise examples of this below and contextualise the need for our integrated perspective of Immersive Personal Visualisation (IPV).

PV – Several surveys investigate how visualisation techniques support the interpretation of self-tracking data. Some focus on specific application areas like health and wellness [77], while others consider how data is presented either to users or third parties [85]. Neupane et al. [56], for instance, review visual feedback in fitness tracking systems. However, most of these works centre on screen-based dashboards and largely overlook embodied or immersive representations.

IV – Other reviews focus on how immersive technologies are used to visualise information. For example, Liu et al. [43] scope interaction techniques in XR visualisations, while Bassano et al. [5] and Nijholt [57] examine domain-specific use cases such as social XR and exergaming. Yet these works rarely foreground visualisation as a medium for self-reflection or personal meaning-making, often prioritising task performance or entertainment.

IPV – Survey work connecting personal visualisation and immersive visualisation is especially limited. The exergames survey mentioned above [5] does touch lightly on personalisation and tracking, and Vasarainen et al. [80] explores XR in professional life. However, these do not explicitly examine how XR technologies support the personal informatics lifecycle, such as data collection, reflection, and behaviour change. More recent work has explored how physiological data streams

[1] https://www.ray-ban.com/usa/discover-ray-ban-meta-ai-glasses/clp
[2] https://www.oakley.com/en-us/l/oakley-meta

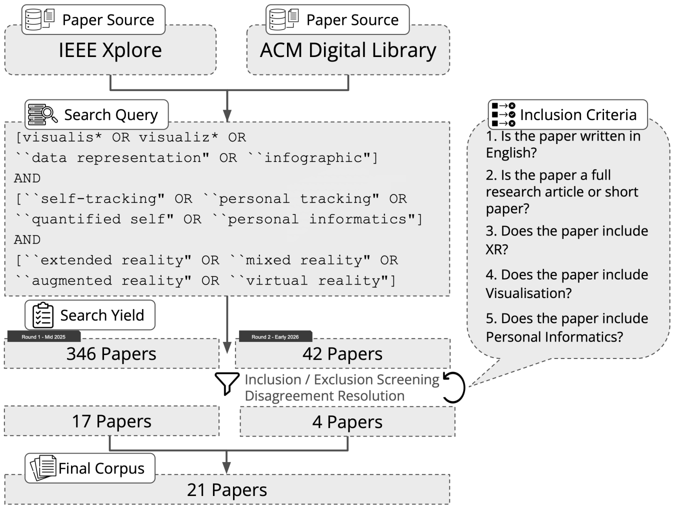

Figure 2: Depiction of the methodology used in this paper.

are managed across wearable devices and tools [72], but does not discuss how this data is ultimately presented or visualised back to the users.

Our review builds on these partial connections by systematically mapping the intersection of personal visualisation and immersive visualisation. We analyse how data is collected, represented, and experienced across these domains, highlighting emerging approaches that integrate embodied, affective, and situated forms of engagement. This integrative perspective surfaces research gaps and provides a foundation for future research aimed at humanising personal data experiences across modalities and moments of everyday life.

3 Methodology

Our scoping review is aimed at characterising research that exists at the intersection of **Personal Visualisation** and **Immersive Visualisation** in the emerging space we refer to as ***Immersive Personal Visualisation***. Our goal is to detail existing work in this space in order to identify current trends, challenges and research opportunities. For the purpose of our literature search we defined **Personal Visualisation** as work that explored *Personal Informatics* and *Visualisation*. For **Immersive Visualisation** we defined this as work utilising *Visualisation* with *Extended Reality*. We selected the ACM digital library and IEEE Xplore as the databases for our search as they covered a wide range of the top venues for publications in each of the three domains (Visualisation, Personal Informatics, and Extended Reality), including but not limited to IEEE VIS, TVCG, ACM CHI, IMWUT, IEEE VR, ISMAR, and UIST, among others. We chose to survey work published in the last 20 years, covering 2005 to the start of 2026. Our methodology was informed by historical work establishing scoping reviews as a research method for emerging domains [3] and work that synthesised and advanced these techniques [62]. Our specific methodology follows procedures laid out in similar scoping reviews in HCI literature, especially those focusing on personal informatics tools [19], how users interact with these systems [6, 22], and work that established future research agendas [70]. Our scoping review consisted of 5 stages: (i) search term formulation, (ii) database search, (iii) inclusion screening, (iv) disagreement resolution, and (v) inductive coding.

The majority of the review was completed in mid 2025 with a second round executed in early 2026 to collect additional papers.

3.1 Search Term Formulation

To identify relevant papers, we constructed search queries using 12 keywords spanning the domains of personal informatics, extended reality, and visualisation. These terms were finalised through collaborative discussion and iterative exploration of search result volumes. Within each domain, keywords were combined using *OR* operators and searched across titles and abstracts. The initial result volumes are summarised below.

- Personal Informatics keywords. [“self-tracking" OR “personal tracking" OR “quantified self" OR “personal informatics"]

  ACM results - 2,486
  IEEE results - 14,621

- Data Visualisation keywords. [visualis* OR visualiz* OR “data representation" OR “infographic"]

  ACM results - 134,677
  IEEE results - 288,987

- Extended Reality keywords. [“extended reality" OR “mixed reality" OR “augmented reality" OR “virtual reality"]

  ACM results - 3,949
  IEEE results - 60,806

3.2 Database Search

We executed our keyword search using the ACM Digital Library and IEEE Xplore online search tools. This search was executed across all of the available metadata in each tool which included the title, abstract, keywords, and full text (where possible). Our final search query consisted of a logical *AND* of the search terms across the domains:

```
   [visualis* OR visualiz* OR
‘‘data representation" OR ‘‘infographic"]
AND
[‘‘self-tracking" OR ‘‘personal tracking" OR
‘‘quantified self" OR ‘‘personal informatics"]
AND
[‘‘extended reality" OR ‘‘mixed reality" OR
‘‘augmented reality" OR ‘‘virtual reality"]
```

This returned 388 results. We then exported their BibTeX citations with abstracts and screened them for inclusion.

3.3 Inclusion Screening

Three coders independently reviewed all 388 papers by examining the title, abstract, and, when necessary, the full text. Each paper was evaluated against five inclusion criteria, and inclusion in the final corpus required unanimous agreement among the coders.

1. Is the paper written in English?
2. Is the paper a full research article or short paper?
3. Does the paper include Extended Reality?
4. Does the paper include Visualisation?
5. Does the paper include Personal Informatics?

Papers meeting all five inclusion criteria were included in the final corpus. The initial screening yielded consensus on 6 inclusions and 310 exclusions. 119 of these papers were excluded for not being a full or short research paper (e.g., workshop papers) whilst the majority of the remaining exclusions were due to one of our search terms appearing only as a passing reference in related work, or in the title of a cited article. The remaining 72 papers, where disagreements occurred, were resolved through discussion.

3.4 Disagreement Resolution

Following the initial round of inclusion coding, we calculated inter-rater reliability using Krippendorff’s α for multiple raters and features. The resulting value of **0.5704** indicates moderate agreement, but also points to inconsistencies in the interpretation of the inclusion criteria. Further examination of the disagreements revealed ambiguity around criteria (3), (4), and (5) – particularly in assessing whether a paper involved an extended reality approach (3) or addressed personal informatics (5).

To resolve disagreements and clarify the scope of the three key domains, all three raters revisited the 72 contested papers and collaboratively discussed their coding differences. Through this process, we iteratively refined and formalised working definitions for each domain. The final definitions below reflect the shared understanding that guided our resolution process:

Personal Informatics – A paper was classified as personal informatics if it involved individuals engaging with *their own* data. Crucially, the data had to be *reflected back to the user* – we excluded studies where only third parties (e.g., clinicians) viewed patient data. Personal data could include physiological signals (e.g., [33]) or subjective inputs like emotions (e.g., [76]), as long as it was used for self-understanding or self-expression (e.g., [66]).

Visualisation – We considered any form of data representation, not just traditional charts. This included visual (e.g., [2]), auditory (e.g., [67]), or physical and haptic modalities (e.g., [53]), as long as data was made perceptible to the user.

Extended Reality – We classified a paper as extended reality (XR) if it involved – or explicitly envisioned – interactions using XR technologies. This included both implemented systems (e.g., [53]) and speculative designs (e.g., [17]) grounded in immersive technologies. Building on prior definitions [8], we considered XR to include: virtual reality (VR), which simulates entire environments; augmented reality (AR), which overlays digital content onto the physical world; and mixed reality (MR), which enables interaction between physical and digital elements. We excluded work using only situated visualisations with physical displays (e.g., [10]), as our focus is on XR-facilitated immersion rather than static, co-located representations.

Following the collaborative coding process, we reached consensus on all but 8 papers. These remaining cases were reviewed with two additional researchers, resulting in a working corpus of 23 papers.

3.5 Inductive Coding

Due to the small corpus size, we employed inductive open coding to identify salient features and themes. Two authors independently coded randomly assigned subsets of papers, then met after each round to discuss and refine the emerging code structure. After two rounds of iterative coding, we arrived at a stable schema comprising 33 features. Two authors then independently refactored the most granular features (the features with the highest number of unique codes) utilising an affinity diagramming [25] approach to group the low-level codes into more salient 'sub-feature' groups to improve the interpretability of the results. The two authors met iteratively, and refined these sub-features until they reached a consensus and verified this with the remaining authors. The final schema consisted of 33 features organised into 9 thematic categories.

During the coding process, two additional papers were excluded for lacking relevance to at least one of the three focus areas, resulting in a final corpus of 21 papers. The coding schema and fully coded corpus are provided as supplementary materials.

4 Findings

4.1 Corpus Composition

Our final corpus includes 21 papers published across 12 venues. Although our search spanned the past 20 years, the earliest relevant work appeared only in 2016 (Fig. 1). Whilst this is certainly reflective of when XR technology became more broadly available, it also highlights the nascency of this intersection.

The ACM CHI Conference was the most frequent publication venue, with 6 of the 21 papers in our corpus, followed by Designing Interactive Systems (DIS) and TVCG with 3 papers each. The remaining venues include Virtual Reality Software and Technology (VRST), Augmented Human, Intelligent User Interfaces (IUI), Interaction Design and Children (IDC), IEEE Aerospace, ISMAR Adjunct, IEEE Transactions on Neural Systems and Rehabilitation Engineering (TNSRE), IEEE Access, and Artificial Intelligence and Product Design (AIPD) each contributing one paper. This distribution reflects the dispersed and interdisciplinary nature of this emerging space. The relative lack of publications (3/21) at visualisation-specific venues indicates a distinct opportunity for future work in this space.

We present our remaining findings using an interrogative framework, drawing inspiration from prior visualisation surveys that adopt this approach [26, 49]. At the same time, our goal is not only to catalogue what has been built, but also to characterise the underlying orientation of this emerging area. Across the corpus, IPV work consistently emphasises experiential and affective engagement with personal data, rather than traditional analytical interaction and longitudinal sensemaking in visualisation research. We interpret these findings not just as descriptive trends, but as evidence of a shared design logic shaping IPV.

4.2 Contribution Types and Application Domains

Across the 21 papers, contributions clustered into three primary approaches: (i) consumer-facing systems, (ii) developer-facing tools, and (iii) theoretical or vision pieces. These contributions were not mutually exclusive, with several papers combining conceptual contributions with implemented systems.

Audience and artefact The vast majority of work in immersive personal visualisation has focused on designing and building systems. Twenty of the twenty one papers implemented some form of artefact, with only one project relying entirely on speculative or visionary methods without a system implementation [17]. Most (18/21) focused on consumer-facing systems that enable individuals to interact with their personal data, though ranged in fidelity from fully implemented systems being used in clinical settings [53], to extremely light-weight proof of concept prototypes [86]. Two papers explicitly targeted developer-facing audiences, offering tools to support the design and implementation of such systems [63, 71]. Both of these also offer theoretical contributions, while one is entirely conceptual [17].

Consumer-facing systems rendered personal data in XR to support a range of goals. For example, ARCADIA [76] employed a mixed reality interface for emotion regulation, while VeatherReflect [81] visualised emotional states by mapping them to dynamic weather patterns. A recurring theme –discussed further in Sec. 4.4-**T3** – was the use of real-time immersive visualisations of time-series data, enabling users to experience their data as it unfolds.

The two developer-facing papers introduce toolkits for building XR-based visualisations of personal data. BodyLayARS [63] proposes a toolkit grounded in the authors' theoretical concept of body-based AR, aiming to lower the barrier for designers prototyping spatial, on-body data encodings. EMOTE [71] presents an interactive system for real-time emotional AR, accompanied by a design space characterizing emotional data representation in AR.

IoT Data in the Home [17] (the sole paper to not implement a system) uses cultural probes to explore how people relate to personal data in Internet of Things (IoT) settings, proposing speculative XR-based approaches for visualising these interactions.

Domains The predominant domain of immersive personal visualisation is health, with 14 out of the 21 papers touching on some aspect of either mental (10/21) or physical (6/21) health, with 2 touching on aspects of both [2, 75]. Several projects explored the application of immersive personal visualisation in a therapeutic and mindfulness context such as Inner Garden [67], which created an immersive environment for meditation and self-reflection using physiological data, while TRAVEE [53] supports physical rehabilitation through body position tracking for stroke recovery.

A smaller subset of papers explored educational contexts, including women's health awareness [2], classroom-based physiological data sharing [33], financial decision making [86].

Another minority (4/21) of the surveyed work also focused on the experiential nature of immersive personal vis and explicitly highlighted this, and enjoyment, as a key aspect of their work in tandem with other focuses of their research [64, 69].

The emphasis throughout the corpus on health reflects trends noted in prior personal informatics surveys [19], but also points to opportunities for future work in lower-stakes domains like casual fitness, media use, or daily routines, areas rich with personal meaning yet comparatively overlooked. Beyond health, several (9/21) papers focused on specific applied domains such as physiological monitoring in space exploration [52], biofeedback for moral decision making [68], tools for engaging with personal sleep data [44], and speculative interfaces for personal expression [66].

Table 1: Overview of the 21 papers included in our final corpus. ✔* indicates a developer-facing (not user-facing) system.

					Role of Visualisation						Personal Data Type							Purpose of Personal Data						Personal Informatics Stages							
Paper Title	**Venue**	**Year**	**Primary Domain**	**System**	Realtime	Affective	Presentation	Instructional	Pleasure	Connection	Physiological	Physical	Psychological	Behaviour	External Data	Synthetic	Financial	Change	Introspection	Data-Focus	Social Connection	Care	Education	Prepare	Collect	Integrate	Reflect	Act	**VR**	**AR**	**MR**
SharedPhys: Live Physiological Sensing... [33]	IDC	2016	Education	✔	x						x	x							x		x		x		x		x	x		x	x
On Looking at the Vagina through Labella [2]	CHI	2016	Physical Health	✔				x				x						x	x						x		x	x		x	
Inner Garden: Connecting Inner States... [67]	CHI	2017	Mental Health	✔	x		x				x							x	x								x	x	x	x	x
Bio-adaptive Social VR...: DYNECOM [69]	IUI	2018	Mental Health	✔	x					x	x		x								x	x					x	x	x		
Attending to Breath: Exploring How the... [64]	DIS	2018	Mental Health	✔	x		x				x								x			x					x	x	x		
The TRAVEE System for a Multimodal... [53]	IEEE Access	2019	Physical Health	✔	x	x		x	x		x	x						x	x			x					x	x	x		
Body LayARs: A Toolkit for Body-Based... [63]	VRST	2020	Tool Development	✔*		x	x					x	x					x			x				x	x	x	x		x	
Sleep Ecologies: Tools for Snoozy... [44]	DIS	2020	Physical Health	✔	x			x			x			x				x	x								x	x	x		
Dear Pictograph: Investigating the Role of... [66]	CHI	2020	Mental Health	✔	x	x			x				x			x			x	x							x		x		
IoT Data in the Home: Observing... [17]	CHI	2020	Applied Domains	✘	x		x							x	x			x		x				x	x	x	x	x		x	
Development of an Augmented Reality... [52]	IEEE Aerospace	2021	Applied Domains	✔	x	x		x			x				x			x	x	x							x	x		x	
EMOTE: An interactive online tool for... [71]	Augmented Human	2022	Tool Development	✔*	x	x							x					x			x					x	x	x		x	
VeatherReflect: Employing Weather as... [81]	DIS	2023	Mental Health	✔	x		x				x		x						x								x	x	x		
SelVReflect: A Guided VR Experience...… [82]	CHI	2023	Mental Health	✔		x							x						x						x	x	x		x		
PSA: A Cross-Platform Framework for... [55]	ISMAR Adjunct	2023	Analysis	✔			x							x						x							x		x		x
ARCADIA: A Gamified Mixed Reality... [76]	CHI	2024	Mental Health	✔	x		x				x		x					x	x								x	x			x
The Utilitarian Virtual Self... [68]	TVCG	2024	Applied Domains	✔		x					x	x		x				x		x								x	x		
"I was Truly Able to Express the Image of... [75]	TVCG	2025	Mental Health	✔	x	x						x	x					x	x								x	x	x		
Visual Disturbances to Avatar Foot Position... [79]	TNSRE	2025	Physical Health	✔	x			x				x						x				x						x	x		
Visceral Notices and Privacy Mechanisms... [59]	TVCG	2025	Applied Domains	✔	x		x					x								x			x		x	x	x	x		x	
AR Finance Partner... [86]	AIPD	2025	Finance	✔	x	x	x	x						x			x	x		x			x				x	x		x	

Tab. 1 details all the papers included in this review. For simplicity we only list the primary domain of focus for each paper, though many papers touched on multiple domains. These contribution patterns suggest that IPV has so far been shaped primarily through prototype building, which helps explain why the field currently appears broad, exploratory, and unevenly distributed across venues and domains.

4.3 Study Design and Implementation

Full details on the devices, tools, and methodologies used across studies—including specific libraries, hardware, and research protocols—are available in the supplementary materials. Below, we summarise key patterns in implementation and study design.

Technical Implementation Unity was the most commonly used framework, with 14 out of 21 papers referencing it for XR development. Several systems also employed WebXR stacks. For physiological data capture, researchers most often used hardware sensors: respiration bands (4 papers), smartwatches (3), and camera/vision inputs (3).

User Studies Most papers involved some form of user study. Nine papers described formal studies during the design phase, often using co-design methods with domain experts; while 18 papers conducted user studies for evaluation. Eight papers included both.

Participant recruitment was typically convenience-based, relying on mailing lists [82] and personal networks [17]. Sample sizes were generally small with design studies ranging from $n = 5 - 100$ and with $\mu = 20.9$ and $\sigma = 27.2$. The median sample size for design was 9.5. For evaluation studies the sample sizes were generally slightly larger with $n = 5 - 69$ and $\mu = 21.3$, $\sigma = 14.9$, median sample size 18.5.

Among evaluative studies, most participants were novice XR users (42 of 51, where XR experience was reported). This reflects the early-stage adoption of XR and highlights a challenge raised by several authors: controlling for the novelty effect of XR. Compounding this issue, studies were limited to single-session lab-based deployments, typically lasting 15–60 minutes. Follow-up methods commonly included interviews (11/21) and survey questionnaires (11/21).

XR Modalities The majority of the papers (16/21) used head-mounted displays (HMDs) to realise their systems, utilising devices such as the Oculus Rift [64] or Meta Quest [55]. Of these, twelve utilised VR-based experiences (with ten of these being exclusive VR solutions). Nine projects leveraged AR capabilities, either through passthrough modes on VR headsets [67] or dedicated AR devices such as Microsoft HoloLens [76], to overlay data onto the physical environment. Four employed mixed reality (MR) approaches that integrated tangible real-world interactions with virtual elements [33]. Three papers explicitly compared different XR modalities to assess their effects on user experience and interaction design. The only major exception to the HMD-dominant trend was Labella [2], which used mobile phone–based AR to create a more lightweight and accessible experience for women's health education.

4.4 Trends

Here we discuss trends that we observe emerging in immersive personal visualisation and label them **T1 - 5** for further discussion in Sec. 5.

T1- Emphasis on Late-Stage, Episodic Personal Data Engagement Given the strong emphasis on consumer-facing systems for presenting personal data (Sec. 4.2), we analysed each paper through the lens of personal informatics models. To better communicate our findings we utilise Li et al.'s Stage-Based Model [42]. This model outlines five stages of user engagement: Preparing, Collecting, Integrating, Reflecting, and Acting. These stages are not mutually exclusive, and most projects addressed multiple stages simultaneously.

As shown in Tab. 1, the surveyed papers skewed heavily toward the later stages of the personal informatics lifecycle, particularly Reflection (19/21) and Action (18/21), with little attention given to earlier stages. Many projects leveraged the specific affordances of XR which lends itself to immersive, embodied experiences and centred on short-term, real-time engagement, such as the meditation-focused breath visualisations in Inner Garden [67].

While some papers addressed data collection, this was typically framed around experimental setup rather than empowering users to collect their own data in everyday contexts. A notable exception is SelVReflect [82], which considered user-driven emotional data capture.

In addition to reflection and action, a few papers explored *expression* (not a stage of existing personal informatics models) as a distinct use case. For instance, Dear Pictograph [66] enabled users to construct their own emotional visualisations in VR, and EMOTE [71] supported real-time expressive AR. These projects illustrate the potential for immersive personal visualisation to explore further work in supporting personal meaning-making and self-expression.

T2 - Affective Engagement over Behavioural Change This focus on *expression*, detailed above, suggests a distinct shift for work at this intersection. Unlike traditional personal informatics research where most prior surveys show that behavioural change is a key focus [19] our characterisation of the corpus indicated that work typically described introspection (12/21) as the key driver for interaction with personal data in the systems, specifically examining self-awareness (8/21) or self-reflection (5/21) [82]. Whilst 13/21 papers also touched on change or improvement only 5 of these explicitly discussed behavioural change [53] in the traditional sense of personal informatics. This trend reflects the potential of immersive environments to facilitate more affective personal data interaction and reflection beyond the focuses of traditional personal informatics systems. However, other trends, such as **T3** indicate this self-reflection and awareness is currently limited to ephemeral short-term interactions.

T3 - Real-Time Engagement Prioritised Over Historical Exploration The majority of papers focused on physiological data streams (12/21) which were typically captured via sensors such as smartwatches [67, 76] or respiration bands [64, 69]. The next most common focus was on affective data (8/21), including emotion and stress levels, either self-reported [66] or inferred through wearable sensors [81].

In addition, the visualisations in three quarters of surveyed projects (15/21) dynamically reflected users' data streams in real-time, typically with the aim of enhancing awareness and supporting goals such as self-reflection or self-understanding (**T2**).

Existing, non-immersive, PV systems generally focus on presenting users with historically recorded data and involve retrospective engagement to support reflection on past behaviour [11,13] often tied to driving long-term behaviour change. However, we observed that immersive personal visualisation work currently has an emphasis on real-time, sensor-based, time-series data which highlights a distinctive affordance of immersive visualisation (particularly in AR): the ability to surface data in situ. However, in tandem with **T1** this also reinforces a focus on ephemeral rather than historical interaction. Most systems prioritised immediate awareness over longitudinal insight.

A notable exception is one of the projects case-studied in Sleep Ecologies [44], which visualised a user's sleep history as an explorable forest, also drawing on natural metaphors (**T4**), to support reflection over time, rather than in-the-moment awareness.

The emphasis on short-term, real-time interaction can also be partially explained by the prevalence of work utilising HMDs in this corpus (Sec. 4.3). The use of HMDs inherently favours immersive, presence-driven experiences that are temporally bounded, as HMDs are known to be ill-suited for prolonged use and tend to emphasise immersion and scenario engagement [37]. These constraints align with authors' stated goals: 14 of the 21 papers framed extended reality as a mechanism for immersive engagement, with several aiming to temporarily remove users from their surroundings (5/21) or to direct focused attention inward for heightened self-awareness (5/21).

T4 - Expressive and Abstract Representations over Analytical Visualisation The vast majority of papers we surveyed relied on visual representation of data (20/21) with only 1 leveraging purely haptic feedback of data [53].

Some systems did adapt classical visualisation techniques into extended reality, for example, utilising bar and line charts [33,55], or using simplified visual forms to enhance user awareness of key tasks [52] as well as work in the education domain focusing explicitly on using visualisation to communicate accurate data or statistics [2, 33].

However, many projects also leveraged the unique affordances of extended reality to explore more abstract or metaphorical representations. For instance, Romat et al. [66] used pictographs to express affective states. A notable subset (5/21) employed ideas rooted in nature to communicate data. ARCADIA [76] visualised emotion through the vitality of a virtual garden, and Inner Garden [67] mapped breathing patterns to the level of rising and falling seawater. Several of these works (5/21) incorporated multimodal encodings, such as sonification, to enrich the sensory experience and take advantage of extended reality's capacity for expressive, multisensory data presentation.

Although authors frequently described the visual encodings they chose as "intuitive", existing work does not explore how well users actually interpreted the data. In the one case that did investigate this [64], fewer than half of the participants (3 out of 8) correctly understood the system's visual encoding without additional explanation. This suggests that while abstract representations and metaphors may enhance affective engagement, they can also introduce ambiguity and reduce clarity, particularly when users are unfamiliar with the system or metaphor.

T5 - Low Agency in Data Interaction Finally, across the surveyed projects, although IV systems in general are often intended to facilitate higher levels of engagement and interaction (Sec. 2) we observed that interactions in the immersive personal visualisation domain skew heavily toward low-agency viewing rather than interactive exploration. Almost every (20/21) paper relied on observation via gaze- or head-aligned input, with 6 of these offering no other interaction modality, positioning the user primarily as a passive observer. Some systems incorporated controller input (7/21), gesture-based or full-body interaction [33], or limited spatial exploration via locomotion [44]. However, none of the projects supported more analytical operations such as filtering, searching, or comparing data. This emphasis on low-agency interaction aligns with **T3** – emphasising short, lightweight data engagement episodes rather than in-depth exploration. It also reflects current limitations of extended reality platforms in supporting seamless, sustained interaction.

Summary Whilst these trends emerged repeatedly across our corpus, we recognise that IPV remains a nascent research area. As a result, these patterns should not be interpreted as an exhaustive characterisation of this field, but rather as emergent directions which can motivate concrete research directions for future work to investigate and more richly expand the scope of IPV.

The five trends we identified suggest that IPV has emerged less as a direct extension of traditional analytical visualisation and more as a new mode of engaging with **personal** data through immersive, affective, and situated experience. Despite its nascency, the corpus still illustrates that this emerging space remains constrained: it is concentrated in late-stage reflection, oriented toward real-time awareness, dependent on expressive but sometimes ambiguous encodings, and limited in interactive depth. These patterns do not diminish the promise of IPV; rather, they clarify the specific challenges that must be addressed if IPV is to mature into a stronger visualisation research area.

Synthesising T1–T5, we identify three higher-level characteristics of the current IPV landscape: it emphasises experiential encounters over sustained analytical inspection, present-tense awareness over longitudinal understanding, and expressive representation over interpretive transparency. The central challenge for future IPV research is not only to expand the number of applications, but to determine how immersive personal data experiences can also become more interpretable, interactive, and analytically generative.

5 Discussion

Our findings presented in Sec. 4 suggest that IPV is beginning to establish itself as a distinct research direction to facilitate affective encounters with personal data. However, its focus remains comparatively narrow – as we detailed through **T1-5** – centred on reflective, real-time, and low-agency experiences, often in short-term, prototype settings. In this section, we discuss the potential significance of these patterns for IPV and outline a future research agenda through five Opportunities (**O1-5**) which propose supporting longitudinal engagement, interpretability, and meaningful interaction, focusing especially on how visualisation can more fully shape this emerging area.

A key implication of our review is that the main challenge for IPV is not simply recreating traditional personal visualisations in extended reality. Rather, it is determining how immersive systems can retain the strengths of visualisation (e.g., interpretability, comparison, interaction, and sensemaking), without losing the experiential and affective qualities that make XR compelling in the first place, all while continuing to leverage the unique affordances of interacting with personal data. The opportunities below therefore outline responses to the broader structural tensions surfaced in Sec. 4.4: *experience vs. analysis*, *immediacy vs. longitudinal understanding*, and *expressiveness vs. interpretability*.

O1 – Facilitating Lifecycle-Spanning Data Engagement

A unique challenge in working with users' personal data is motivating users to remain engaged with the data *creation* processes in order to benefit from eventual reflection on their own data. In contrast, most traditional analytics systems focus almost solely on user engagement in data *interaction* and *analysis*. As a result, a persistent friction point of existing personal informatics systems is in sustaining the collection, preparation, and maintenance of data [32,47]. Manual tracking can be burdensome to sustain over time, often resulting in reduced motivation and disengagement with tracking, particularly when users must retrospectively reconstruct or record past experiences [21,54]. Prior work has sought to reduce this burden by enabling lightweight reporting interactions on mobile or wearable devices [29, 31], or by utilising physically situated displays to present data in context and encourage engagement [10]. However, these approaches either remain tied to traditional screens, or rely on fixed physical infrastructure. Utilising immersive technologies has the potential to ease these friction points across the whole lifecycle by reducing the dependence on traditional hardware and interaction techniques.

Whilst existing IPV literature focuses on immersing users in later-stage reflective experiences (**T1,2,3**), extended reality is also uniquely positioned to support earlier stages of the lifecycle by surfacing and situating personal data *in situ*. For example, IPV could facilitate situated personal visualisation displays such as those investigated by Bressa et al. which situated physical screens in close proximity with the phenomena that users were tracking [10], without relying on physical hardware in the environment. Existing research has also identified the limitations of physical screens in other domains such as work environments and explored how virtually situated displays can embed information more flexibly within the users' environment [60]. Whilst this work emphasised the potential of eliminating physical screens, they also acknowledged the limitations of existing hardware and HMDs to facilitate meaningful real-world deployment, consistent with our findings (Sec. 4.3) .

This suggests an important direction for future research: investigating how IPV can support lightweight capture, integration, correction, and revisiting of personal data across the full lifecycle beyond just serving as a reflective endpoint. Extended reality technologies continue to move toward lighter-weight, wearable, and commercially available forms which are already integrating cameras for in-situ data collection and surfacing data in users' everyday environments. These capabilities raise design questions about when and how data can be surfaced, alternative techniques for recording data, and how to facilitate interaction and data maintenance without becoming intrusive.

O2 - Beyond Real-Time Awareness: Supporting Historical and Longitudinal Sensemaking

In Rapp and Cena's work exploring the use of personal informatics for everday life [65] they explicitly showed that users often struggled to engage with their data and wanted to be able to more faithfully 're-live' it in order to better understand and remember their experiences. Similarly, the Personal Informatics Analysis Gap [54] highlights the difficulties of users engaging with screen-based representations of historical data *even* in contexts with health critical data where the data could directly impact their quality of life. Other domains, such as infant health tracking, have further emphasised the importance of historical reflection for supporting memory and awareness, and generating behavioural insight [46].

Immersive visualisation approaches have strong potential for supporting engaging, embodied interaction beyond the constraints of traditional displays [38] and in **T2** and **T3** we observed how IPV currently successfully leverages immersion to support rich, real-time awareness and experiential engagement with personal data. However, comparatively little work has explored how these affordances could support meaningful engagement with *historical* data.

By extending immersive approaches beyond momentary awareness, IPV presents an opportunity to transform historical data exploration into situated, experiential encounters. In combination with **O1**, immersive environments could enable users to revisit prior contexts where data was recorded and support reflection through spatial and temporal reconstruction to support deeper longitudinal sensemaking.

O3 - Designing Visual Encodings that Balance Affective Representation and Interpretability

A key strength of the IPV work we surveyed was its emphasis on affective and expressive representations of personal data. Many systems utilised naturalistic and metaphor-driven visualisation environments to encourage emotional self-reflection and introspection focusing on the experiential aspects of personal data interaction [66] – a departure from traditional PV systems focus on behavioural change and self-analysis [19] (**T2,T4**). Even beyond personal data contexts, traditional IV research has also demonstrated that extended reality representations can evoke stronger emotional responses and deeper user engagement compared to traditional visualisation approaches [4,39]. These results have even greater potential when applied to personal data that users already feel deeply connected to.

However, across our corpus, IPV work often described the visual encodings of data as 'intuitive' without empirical validation of users' interpretive understanding [66,71,81]. Moreover, existing visualisation work has shown that users can struggle to interpret unfamiliar encodings when explicit guidance is absent [9], a pattern we also observed in **T4** in the Dear Pictograph paper [66].

This tension between affective engagement and interpretability represents a critical opportunity for visualisation research. Rather than replacing affective representations with analytical dashboards, future work could investigate how the unique expressiveness of immersive environments can be effectively scaffolded to support interpretation whilst preserving their experiential value.

Prior work has touched on users' graphical perception of traditional data representations in augmented and virtual reality [83] but there exists an opportunity to more rigorously evaluate whether accurate communication of information is achievable using 'intuitive' and more expressive techniques and how the personal connection to data in IPV could influence users' perceptions.

Potential directions for novel approaches to presenting and supporting this interpretation include progressive disclosure techniques, context-driven annotation, interactive legends, and embodied tutorial mechanisms. By explicitly designing *and* evaluating for both emotional resonance *and* communicative clarity, IPV systems can support both meaningful reflection and accurate information communication.

O4 - Designing Interaction for Personal Meaning-Making

One of the defining capabilities of IV is its ability to support interaction through embodiment, movement and multiple input modalities. PV research has also emphasised the importance of visual exploration [12] and manipulation of visual representation of data [45] for exploring personal data. However, we saw in **T5** that the majority of IPV systems currently position users as passive viewers, limiting opportunities for active meaning-making and discovery.

Some work has begun to explore limited forms of interaction – such as exploration [44], or interaction via physiological signals [67] – but these capabilities were often constrained, hidden, or insufficiently communicated to users. This highlights a significant opportunity for IPV to support richer forms of data interaction. Unlike traditional immersive analytics where efficient analysis of external data is key, future IPV work can instead explore how immersive technology can allow users to explore data that represents their lived experiences, focusing on interaction to support curiosity and personal interpretation rather than task completion alone.

Future work could investigate and develop interaction paradigms specifically designed for personal data. Potential approaches to this include recreation of, and direct interaction with, environments to allow for spatial organisation and exploration of data not possible in traditional screen-based experiences. Collaborative extended reality also introduces the potential for users to better communicate their lived personal data to others. Rather than adapting analysis tasks, IPV has the chance to develop new forms of embodied interaction which continue to emphasise the importance of affect and experience for users when engaging with their personal data (**O3**).

O5 - Bringing IPV into Everyday Life

Across the systems surveyed, IPV applications were predominantly situated within health-related domains – both mental and physical. These systems were most often evaluated through short, one-off experiments with novice XR users in lab settings (Secs. 4.2 and 4.3). These limitations are partially shaped by technical constraints such as the prevalence of full-VR HMDs, which are difficult to integrate into everyday life. Consequently, little is known about how IPV fits into users' daily routines over extended periods.

Recent developments in lighter-weight and more accessible XR technologies are beginning to support deployment in a wider range of real-world environments such as during exercise [58], or in museums [51]. IPV has the opportunity to leverage this shift to move beyond laboratory prototypes and health-focused applications into everyday contexts. Rather than presenting personal data only during dedicated reflective sessions, future systems could utilise light-weight augmented reality to surface relevant information *in situ* and in the appropriate **context** [35, 36]. For example, users' previous performances during exercise, past journey times while navigating, or memories associated with particular places. Moving into these everyday settings also broadens the range of personal data that IPV can support, extending beyond physiological signals to include users' behaviours, routines, memories, internal states, and emotional experiences through richer forms of interaction (**O4**) and representation (**O3**).

Whilst in-lab research is valuable for developing this early field, leaning on the ability of IPV to deliver always-on and *situated* data requires further research to explore participants' experiences *outside* of lab settings to understand how this could impact users in everyday scenarios. Moreover, longitudinal research is essential to understand how users' experiences change over extended usage as they become more accustomed to the technology. In particular, future work can explore whether IPV systems can be a viable solution to the patterns of disengagement observed in traditional PV tools [21, 65].

Implications for Visualisation Research

Taken together, these five opportunities outline a pathway for the evolution of Immersive Personal Visualisation from short-term, experience-driven prototypes towards sustained, meaningful engagement with personal data. In particular they highlight how *visualisation* research specifically can shape this emerging direction by reconsidering how personal data should be represented and interacted with in immersive environments.

Firstly, IPV requires visualisation approaches that can balance affective expressiveness with interpretability. **T2** and **T4** showed how existing IPV systems successfully leverage more abstract and naturalistic data representations to promote emotional reflection and experiences, but in **O3** we discussed how future work must explore effective visualisations that preserve the experiential value of IPV whilst still supporting communicative clarity. Moreover, visualisation should also focus on rigorous techniques to test and evaluate these encodings to assess both their emotional resonance and their comprehensibility.

We also showed how existing IPV work emphasises real-time experiences over historical exploration (**T3**) whilst positioning the user as an observer rather than an interactive participant (**T5**). In **O2** and **O4** we outlined how future work should therefore explore how visual representations of data in extended reality can support embodied interaction, meaningful navigation, and active data manipulation. In turn, this will also help to address **O2** in allowing users to overcome existing issues in personal informatics systems to explore historical data more effectively.

Finally, future IPV work can move beyond simply facilitating late-stage reflection on data (**T1**) and instead explore ways to surface and visualise data more seamlessly, foregrounding data to users in-situ and facilitate easier data interaction for consumers across all stages of the data lifecycle (**O1**) in diverse contexts (**O5**).

The challenge across all of these directions for visualisation research is *not* to simply recreate analytical dashboards in extended reality environments. Instead, future work should explore developing novel representations and interactions that preserve the strengths of immersive technology that IPV already utilises whilst strengthening user agency and supporting deeper meaning-making, allowing users to connect data to their lived experiences.

Together, these implications highlight how visualisation can help to shape the domain of IPV to support lifecycle-spanning engagement, longitudinal reflection, interpretable representation, active interaction, and deployment in everyday contexts. Furthermore, by moving beyond isolated demonstrations (Sec. 4.3) and toward real-world integration (**O5**), IPV offers the potential to transform how people access, interpret, and live with their personal data.

6 Conclusion

In this paper, we introduced *Immersive Personal Visualisation*, an emerging research direction at the intersection of personal and immersive visualisation. Through a scoping review of 21 papers, we identified key trends prevalent across the domain and proposed a future research agenda formulated around five specific opportunities. Although the field remains nascent, this makes it a critical moment to define its current landscape and future trajectories. Currently, most existing IPV work focuses on the later stages of the personal informatics lifecycle, leaving early stages such as data collection and integration underexplored. We also find that existing work does not leverage the interaction capabilities of extended reality technology, and users are often positioned as passive viewers rather than active participants, limiting their agency in interpreting their data. As immersive technologies become more accessible, immersive personal visualisations hold promise for more active, embodied, and holistic engagement with personal data, reducing friction, deepening reflection, and fostering new forms of self-understanding and expression.

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