Questioning Convention in Machine Learning : Learning Support for GLAM

Transforming Collections : Reimagining Art, Nation and Heritage

University of the Arts London with Tate
Creative Computing Institute

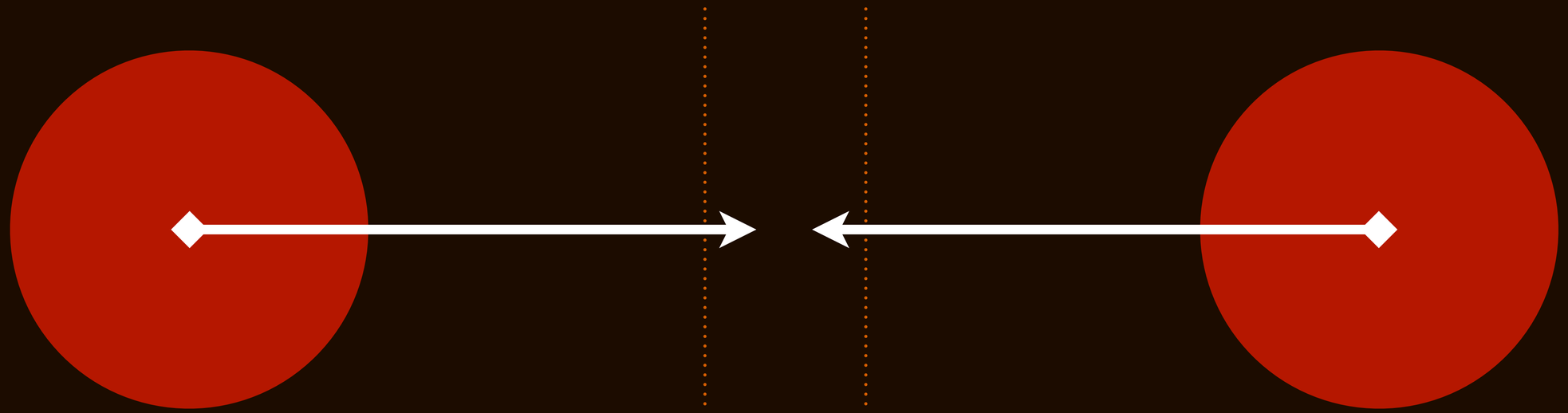
Ireti Olowe : May 10, 2024

Introduction :

Transforming Collections:

- 3-year project
- Part of Towards a National Collection
- Leverage machine learning to surface and address machine bias in museum collections.

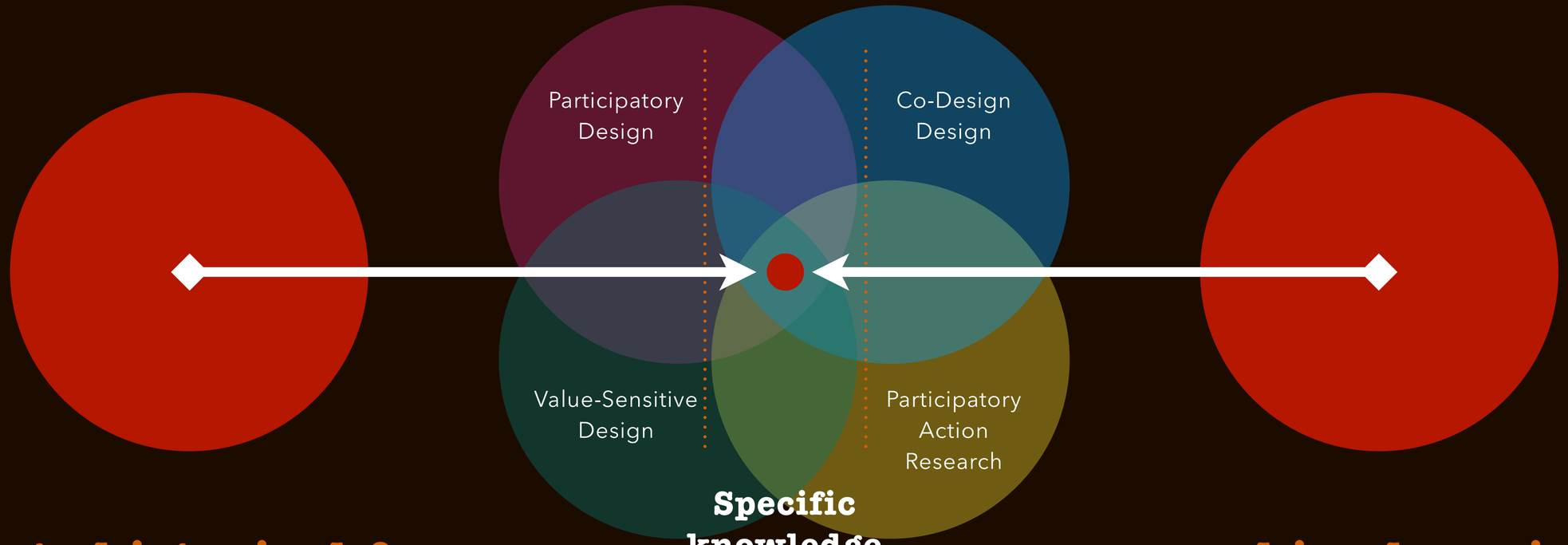
Knowledge Sharing :



arts historical &
museological researchers

machine learning
researchers & engineers

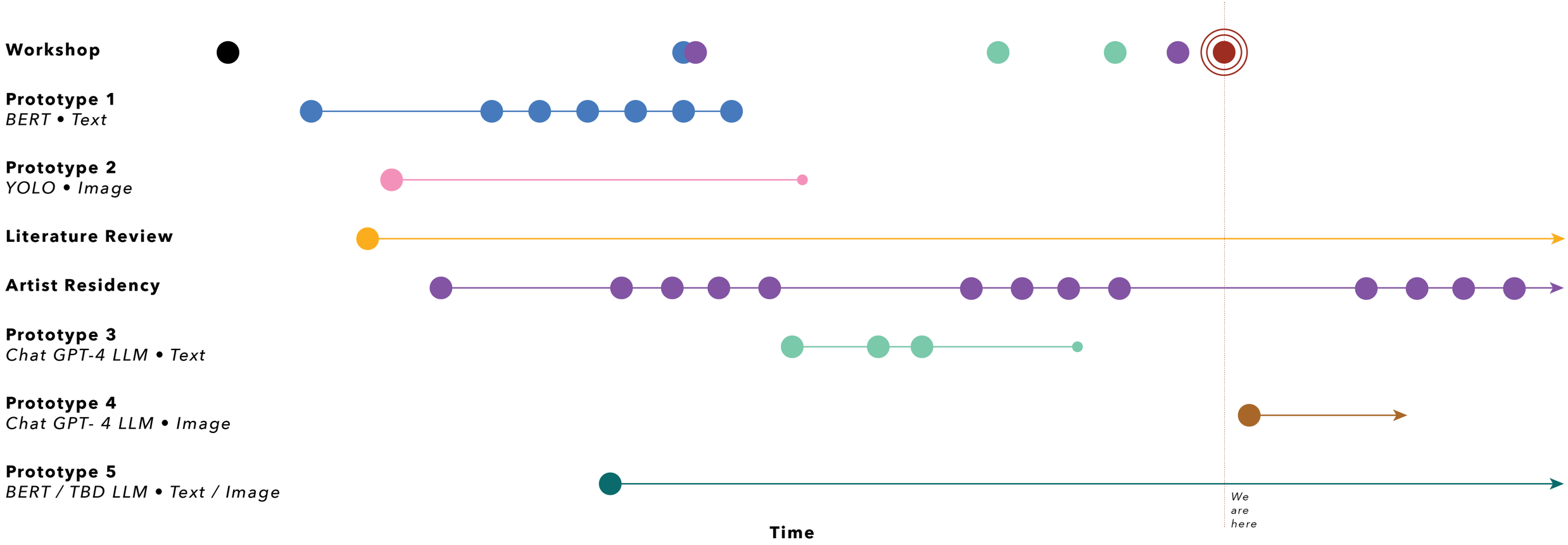
Knowledge Sharing :



arts historical & museological researchers

machine learning researchers & engineers

Transforming Collections Milestone Timeline



BERT • Bidirectional Encoder Representations from Transformers
YOLO • You Only Look Once, Real-time object detection algorithm
Chat GPT-4 LLM • Chat generative Pre-Trained Transformer, Large Language Model

Approach to Discovery :

Method(s):

Workshops
Literature Review
Prototypes (Research Through Design)
Artist Residency

Our Hypothesis:

Machine learning may provide methods that enable GLAM stakeholders to interact, inspect, intercede, and achieve conventionally unaddressable tasks.

Approach to Discovery :

Our Research Areas:

- Digital Humanities

Our interest in Digital Humanities concerns leveraging digital methods to perform tasks situated in gallery, library, archive, and museum (GLAM) practice that require technical means to accentuate human agency and address contemporary challenges for interacting with collections.

For us to understand how to access information and build collection-based tools, we needed to understand what collections are. They have physical and digital manifestations whose varying implications affect how we negotiate with them. We also needed to understand how galleries, libraries, archives, and museums (GLAM) understand their users in the context of the classification the sector uses to define them, their behaviors, and situational needs.

Approach to Discovery :

Our Research Areas:

- Interactive Machine Learning, Explainable Artificial Intelligence, Human Computer Interaction, and Social Transparency

Automation is a prevalent machine learning goal that influenced the perspective of workshop participants in ascribing its ability to help them. Interactive Machine Learning, along with Explainable AI, Human Computer Interaction and Social Transparency, offer understanding about how to build tools and services that enable human and social agency rather than expulsion. Automation is the antithesis of what we what to provide and of any approach towards meeting Transforming Collections' objectives. Rather, we seek to provide methods, not solutions. What we seek is to use machine learning to facilitate rather than solve.

Approach to Discovery :

Our Research Areas:

- Graphic User Interfaces for Large Language Models

Large Language Models have introduced new models of human interaction with computers and computer software. Understanding developer and end-user interactions related to large language models may inform methods for interacting with GLAM collections and understanding their unique affordances.

Approach to Discovery :

Our Research Areas:

- Data Visualization

By understanding the context of data visualization within GLAM, machine learning, and large language models, respectively, we can understand how to employ visualization as a strategy for narrative and analysis. This may better aid end-users in knowledge discovery and decision-making.

Approach to Discovery :

Our Research Areas:

- Tools for Thought and Knowledge Management Systems

Understanding how social and personal Tools for Thought and knowledge management systems are developed and used, we can reason about knowledge sharing in collaborative and collective contexts: creating, developing, and evolving knowledge in communities of specific practices.

Understanding :

Collections

Users

Interactions

Interfaces

Visualizations

Domain

Research Questions:

(Q1) What / Who are they?

(Q2) What is the significance / relevance?

(Q3) Why is machine learning required?

(Q4) What are our challenges?

(Q5) How do we address the challenges?

Understanding Collections :

- Objects & Things
- Cultural artifacts & items
- Representational systems
- Amorphous in form, interpretation, identity, and institutional relevance
- Holds unique set of affordances without standards for transforming them into data

Machine learning offers the possibility to transform collections (as data) dynamically, spatially, and dimensionally, providing a non-linear, scaled, and emergent exploratory experience.

Understanding Users :

- Heterogenous group of people
- Differences in practice, approaches, and motivations
- Galleries, Libraries, Archives, and Museums manage information distinctly
- Users, from novice to expert, have differences in expertise, behavior, needs, and motivations

Machine learning enables us to address challenges that meet the needs of our heterogenous users, which involves identifying user requirements that satisfy a broad set of needs, providing interactive and usable dynamic tools that evolve as needs evolve, and documenting the complexity of decision-making and knowledge generation.

Understanding Interactions :

- People & machines are adaptive and evolve as they learn
- The end-users is a perpetual novice, working with information that updates consistently
- Relationship between user and system — conversational vs. responsive
- The breadth pf practice represented in GLAM abhors one-size-fits-all interactions

Researchers from the arts historical and museological strand, which represents this breadth, help us understand what type of data is required, what decisions need to be made, and how to acquire quality information for building models that meet end-user needs by practice.

Understanding Interfaces :

- Interface design informed by dynamic and relational changes in information
- Building interfaces for end-users who may not share special knowledge about ML processes
- Use machine learning as an enabling architecture with functionality to facilitate end-users

We can only anticipate how other people will use the interfaces we develop. It is unclear to us how they will manage and react to information within interfaces before they use them.

Understanding Visualization :

- Visually interpreting information – generated or referenced
- End-users interact with information related to digitized representations of cultural collections
- There are dimensions of visualization
- Managing collections involves processes of communication, collaboration, analysis, curation, inquiry, annotation, interpretation, and decision-making

What does collections-as-data mean. What does data represent? How is data constructed? How is data represented? What contexts of data impact its meaning and / or interpretation? We need to understand the constrains for preserving information and form in terms of mutability, organization, and orientation.

Understanding Domain :

• Tools such as Obsidian, Notion, and Roam Research provide prototypical approaches for developing individual collaborative, and organizational note-taking, knowledge-generation, and communication mechanisms.

• Knowledge Management provides a taxonomy, classifying knowledge, information, and data, which are the basic units for facilitating interactions between cultural collections and our end-users.

Evolve and develop digital methods by leveraging tacit and embedded knowledge specific to GLAM practices. Leverage tacit and embedded knowledge towards knowledge-generation and sharing explicit knowledge. Expand collections-as-data to include processes for generating explicit knowledge as a part of collection representations.

Pillars of Bias :

- Design principles around bias in museum collections: Context, Transparency, and Absence
- CONTEXT - art objects and an artist’s existential relations to art objects
- TRANSPARENCY - machine learning algorithms, the constructed data set and its use to train machine learning models, and of art objects
- ABSENCE - making art objects and artists apparent, more visible, and identifiable

Prototypes :

What meaningful tool(s) can we build for specific use cases that satisfy end-user needs?

- (1) Text classification training BERT (Bidirectional Encoder Representations from Transformers) models by labeling text-based classifiers in text.

- (2) Image classification training YOLO (You Only Look Once, a real-time object detection algorithm) models by labeling image-based classifiers.

- (3) Text, (4) Image classification training Chat GPT-4, a Large Language Model.

Learning Outcomes :

- Design principles around bias in museum collections: Context, Transparency, and Absence
- CONTEXT - in practice-specific questions posed by the end-user
- TRANSPARENCY - the personally-constructed data sets used to train machine learning models, and the intent of the collections they critique
- ABSENCE - in structural and institutional resources

When we center technology, we look for affordances to provide opportunities to innovate. To overcome the conventions of machine learning, we center arts historical and museological practice to discover opportunities that the practices themselves afford and offer for innovation.

Thank you .

ual: university of the arts london

TOWARDS A NATIONAL COLLECTION

Arts and Humanities Research Council