AI in the Archives:

Wise Oracle or Master Manipulator?

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AABC-ARMA
Online
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Agenda

- Introduction
- Background
- AI in/for archival/records work
- Bringing AI to archival functions - ITrust AI case studies
- Questions?
- Thank you!

I respectfully acknowledge that I live and work on the traditional, ancestral and unceded territories of the xʷməθkʷəy̓əm (Musqueam), Sḵwx̱wú7mesh Úxwumixw (Squamish), and səl̓ilw̓ətaʔɬ (Tsleil-Waututh) Nations.

Records & technology: a love/hate relationship?

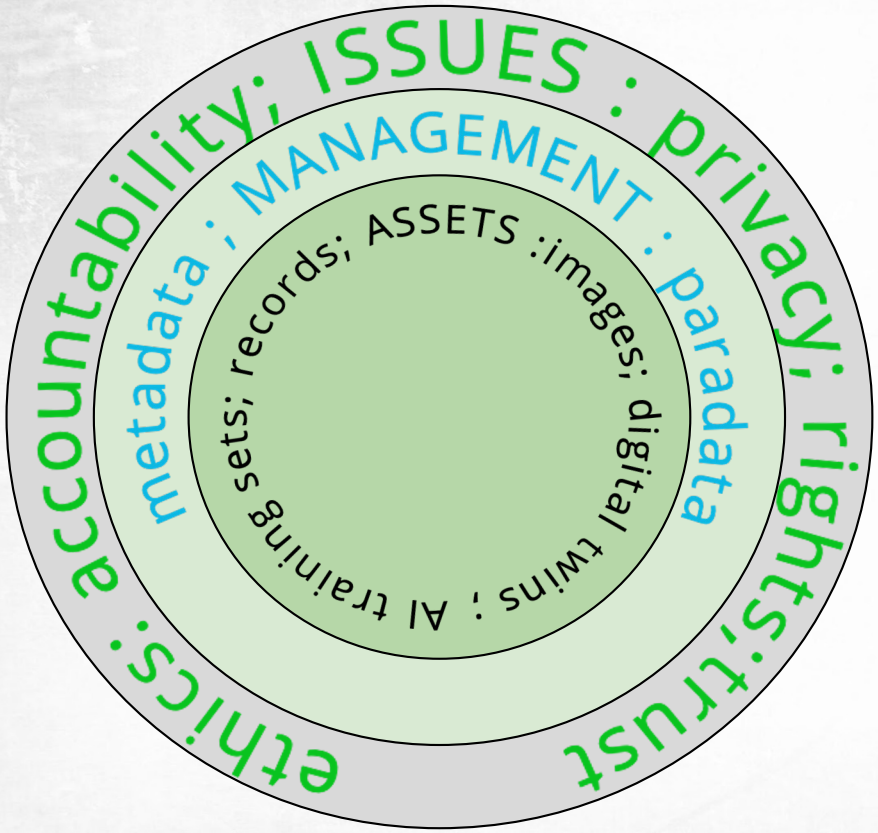
- “In the past 30 years the archival profession in the United States has developed from all but nonexistence into a respected body of professionals who have produced many innovations meant to make sources more readily available to researchers.”
- “It is, therefore, one of the tasks of the archivist, working from the baseline of his own historical background, to devise and improve ways in which fellow historians can probe the sources of information available to them.”

James B. Rhoads, The American Archivist, vol. 32, No. 3. July 1969

Records & technology: a love/hate relationship?

- 1970s and 1980s: “Machine-readable records” - are they records? Should they be kept? How should they be appraised?
- 1990s and 2000s: Electronic records… digital records - national and international research projects on preservation, significant properties, authenticity and trustworthiness
- Evolution of technology from databases to office systems to interactive systems, dynamic systems, expert systems, rule-based systems to predictive systems to generative systems…to…?

Technology changes; the questions remain



Curved text: https://www.mockofun.com/

Social factors:

- How to establish authenticity
- How to protect trustworthiness?
- What is meaningful access?
- What to preserve?
- Who decides?
- Who preserves?
- When?
- Where?

Technical issues:

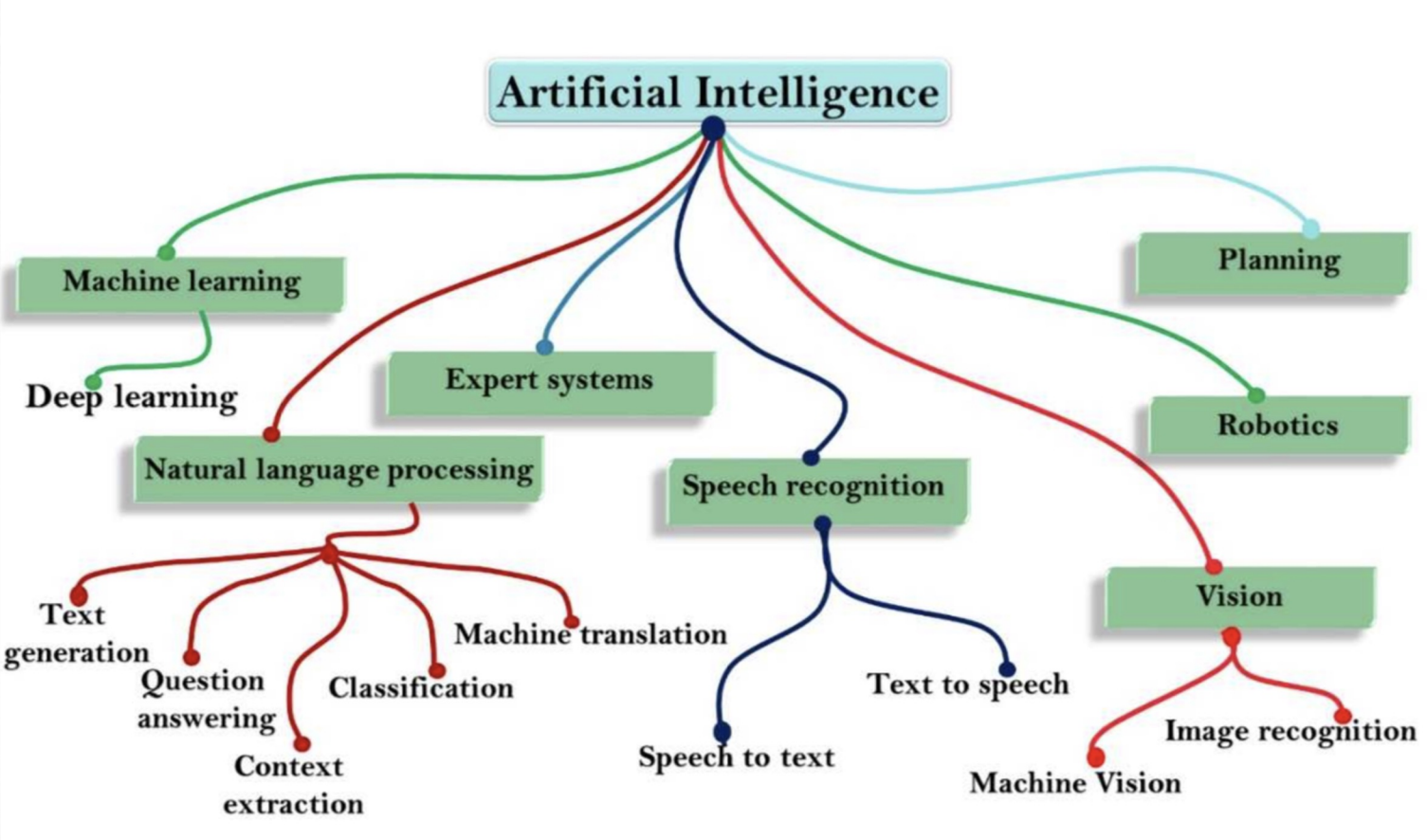
- How to provide access?
- How to ensure preservation?

Artificial Intelligence in our daily lives

- Smart assistants, smart homes
- Managing customer relationships
- Recommendation systems
- Travel and navigation
- Healthcare and medicine
- Generative AI
  - GANs (generative adversarial networks) produce artworks
  - RNNs (recurrent neural networks) compose music
  - NLP (natural language processing) generates text
- *And more… and more… and more…*

Digital Media Blog, 17 Best Examples of How AI is Already Used in Our Everyday Life, Daniel Rivas, April 22, 2024

AI is an umbrella term



MA06 Ken Thibodeau, Metastudy, ITrust AI

AI is an umbrella term

InterPARES TrustAI

Machine Learning

Systems learn from data; results improve over time

Unsupervised learning
Supervised learning => Reinforcement learning (remember Pavlov?)

- Trained on data sets
- Tagged or untagged
- Predictive
- Validity of predictions depends on quality and comprehensiveness of data

Deep Learning

Subset of ML using neural networks to learn from data

Complicated, "deep" artificial neural networks simulating the complexity of the human brain

- Trained on large data sets
- Labelled data
- Layers of interconnected nodes
- Each node learns one feature of the data

Computer Vision

Interpreting and understanding visual information

Identifying, locating, predicting, classifying, generating images

- Image detection
- Image classification
- Segmentation
- Image generation

NLP

Interaction using natural language

Understanding, searching, identifying, classifying, generating text using natural language

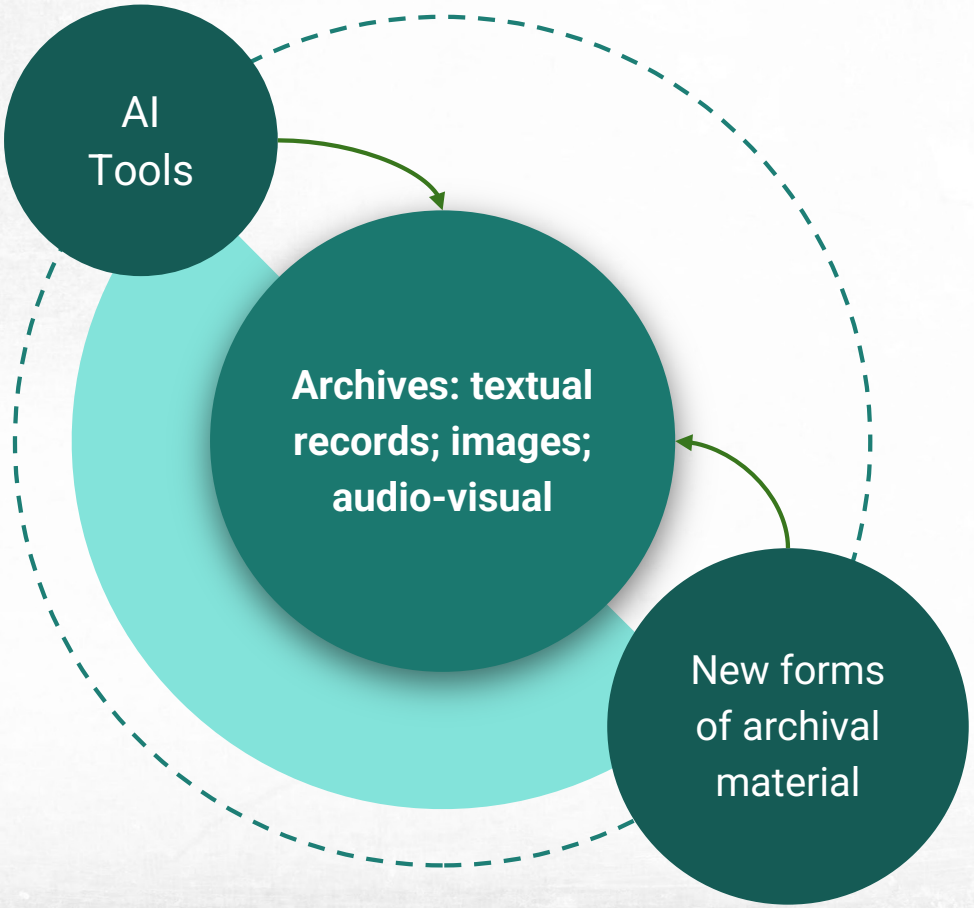
- Named Entity Recognition
- Sentiment analysis
- Classification
- Text generation
- Translation

AI in the archives - the current state

- Precursors: visualization and VA, TAR
- AI is already being used in some (many?) archives
- Many (most?) archives do not have the resources - technical, human, time, financial to bring AI into archival processing in a meaningful way
- Tools are commercial off-the-shelf or bespoke
- Tools may use archives but don't then become embedded in archival workflows
- Training data is local
- Labelling is either AI-driven or expert driven (and labour intensive)
- Human oversight is required

The datafication of archives

- Automated classification (ex. email)
- OCR
- Automating digitization
- Enhancing metadata
- Transcription
- Translation



- Training data sets
- Algorithms and algorithmic processes
- AI-generated content
- Sensor data
- Digital twins

AI for the archives - the current need

- Can we develop AI systems for records and archives that:
  - Are fit for purpose, efficient
  - Recognize and maintain the nature and trustworthiness of archival material and its context(s)
  - Provide trusted access to archives that respects privacy, rights
  - Document and make transparent the provenance of material derived from different sources and combined in ways different from its original purpose

AI for the archives - work in progress

- Where can AI help in archival processes and processing?
  - Serving diverse communities
  - Multilingual NLP
  - Multimodal OCR and HWR models
  - Speech processing: language and dialect recognition
  - PII identification
  - Toxic/offensive speech recognition and process transparency
  - Ethical issues
- InterPARES Trust AI is addressing these topics directly, and building tools that will be freely available

ITrust AI: Harnessing AI in records workflows

Creation & Use

Record types; classification; sensitivity review

What can archives expect to acquire? What complex, multimodal record forms will RMs have to manage?

- Supervised learning
- Machine translation
- Topic modeling
- Offensive speech detection
- TAR, VA

Appraisal/ Acquisition

Records management; appraisal at scale

Appraisal - proactive or reactive? Improving discoverability for non-dominant groups; classifying unstructured data

- OCR, HWR
- Supervised learning classifiers
- Named Entity Recognition
- Machine translation
- Fuzzy matching

Arrangement /Description

Identifying multiple record contexts; generating metadata

Capturing provenance; linking records and aggregations; recreating aggregations

- Fuzzy matching
- Off-the-shelf tools
- Deep learning
- Multimodal applications
- Computer vision

Retention/ Preservation

Applying retention schedules; trustworthiness

Managing preservation risks; identifying preservation requirements; paradata for AI tools

- Computer vision
- Machine learning
- Deep learning

Management/ Administration

AI literacy; competencies; ethics; education

Understanding what archivists/RMs need to know; identifying ethical issues; handling PII.

- Natural language processing
- Training data sets
- Manual and automated labelling and classification

Reference & Access

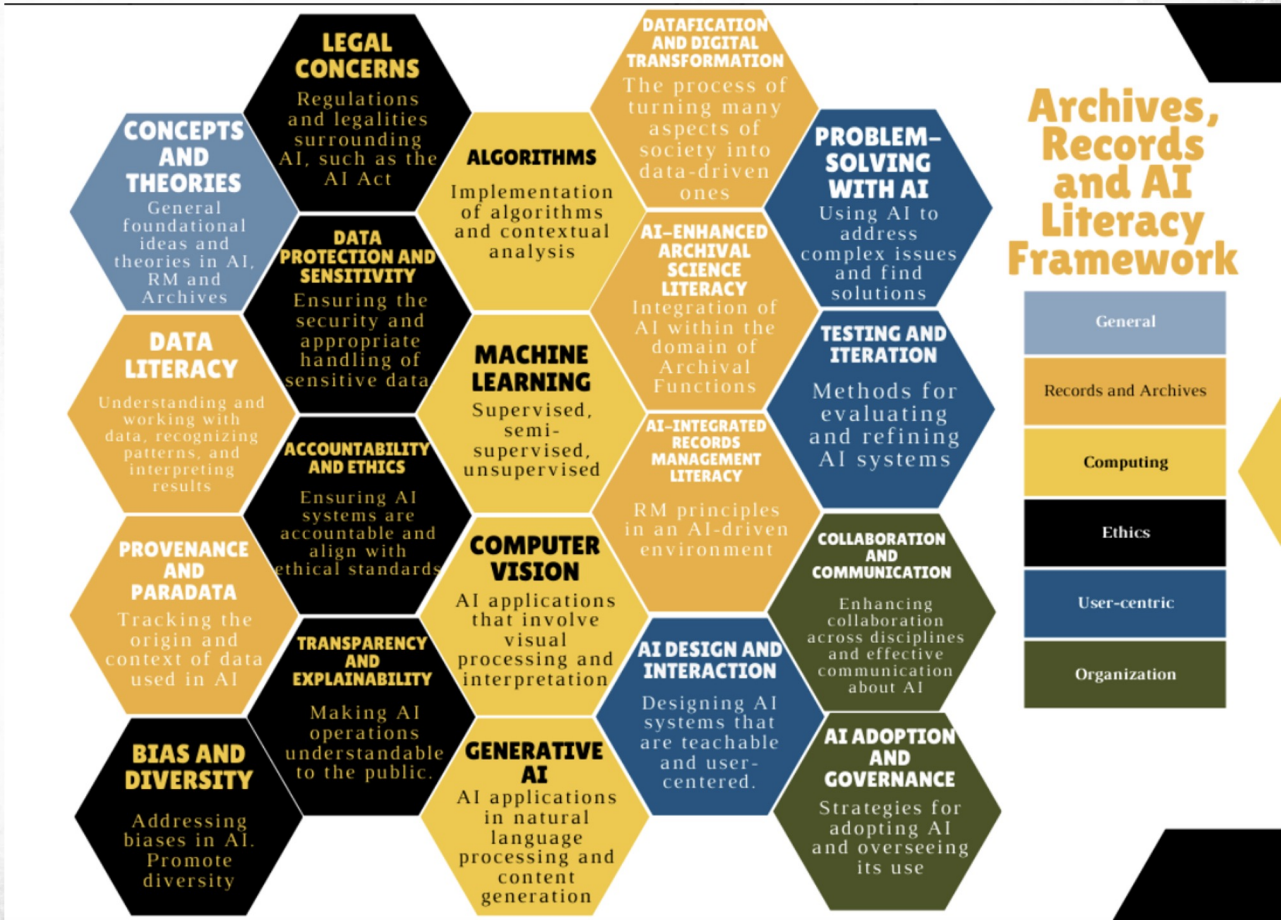
Multimodal and expanded access; enabling research

Enabling access for non-traditional users; targeted access; expanded research methods

- AI-Archivist (ChatArchivist)
- Analytics
- NER; Topic modelling
- Visualization
- Automated recommendations

AI Literacy for records professionals

- What do records professional need to know about AI?
  - Competencies necessary for critical AI evaluation
  - Analysis of digital transition
  - Impacts on labour dynamics
  - Communications challenges



MA02 - Moises Rockembach, University of Coimbra, Portugal

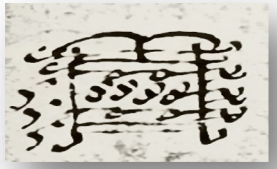
UNESCO Radio Archives

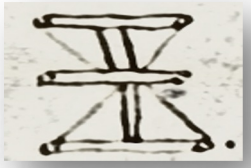
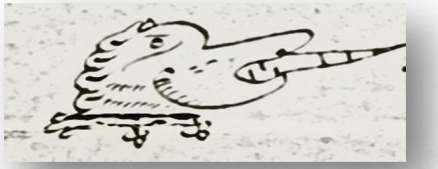
- 16,000 audio recordings from 1950s to 1980s, < 1,000 described
- Over 70 languages, often many in one recording
- Wide range of topics (education, culture, natural sciences, UNESCO history…)
- Interviews, speeches, education programs
- How to describe and make these accessible?
  - Spoken language identification
  - ASR transcripts - accuracy dependent on language ID (LID)
  - Speaker identification
  - Metadata enrichment: Speaker ID, LID, transcript, extractive summary
  - Diplomatics-informed extractive summarization
  - Transcription and translation quality analysis
  - Domain-adapted index of speakers

RA03, Eng Sengsavang, UNESCO; Peter Sullivan, UBC

Understanding medieval charters

- State Archives of Milan has >130,000 parchments covering 1000 years of history
- Studied since the 18th century, and now being digitized, but individually
- AI and deep learning is now allowing systematic analysis to identify common features and automatic processing at scale
- Research question: What notaries and notarial activity can be identified in and around Milan in the 12th and 13th centuries?

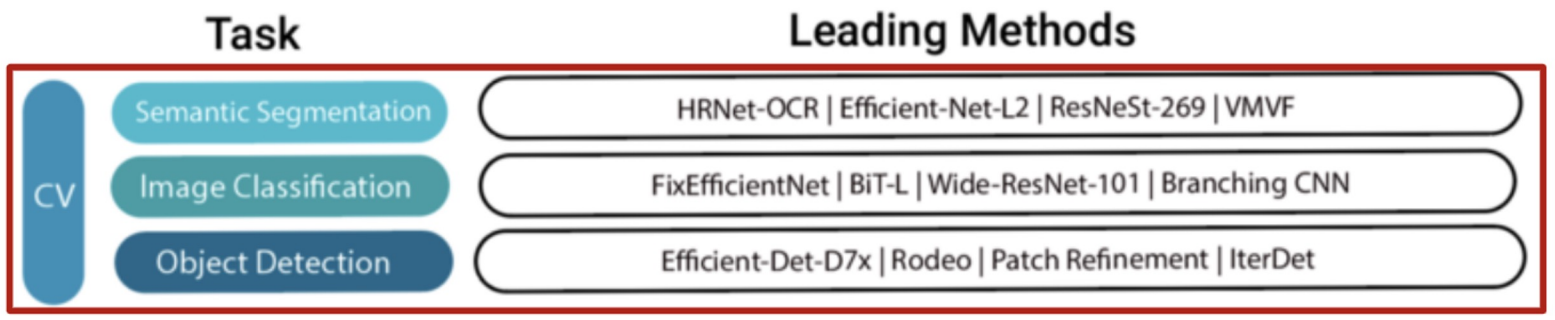


AD03, Emanuele Frontoni, Pierluigi Feliciati, University of Macerata

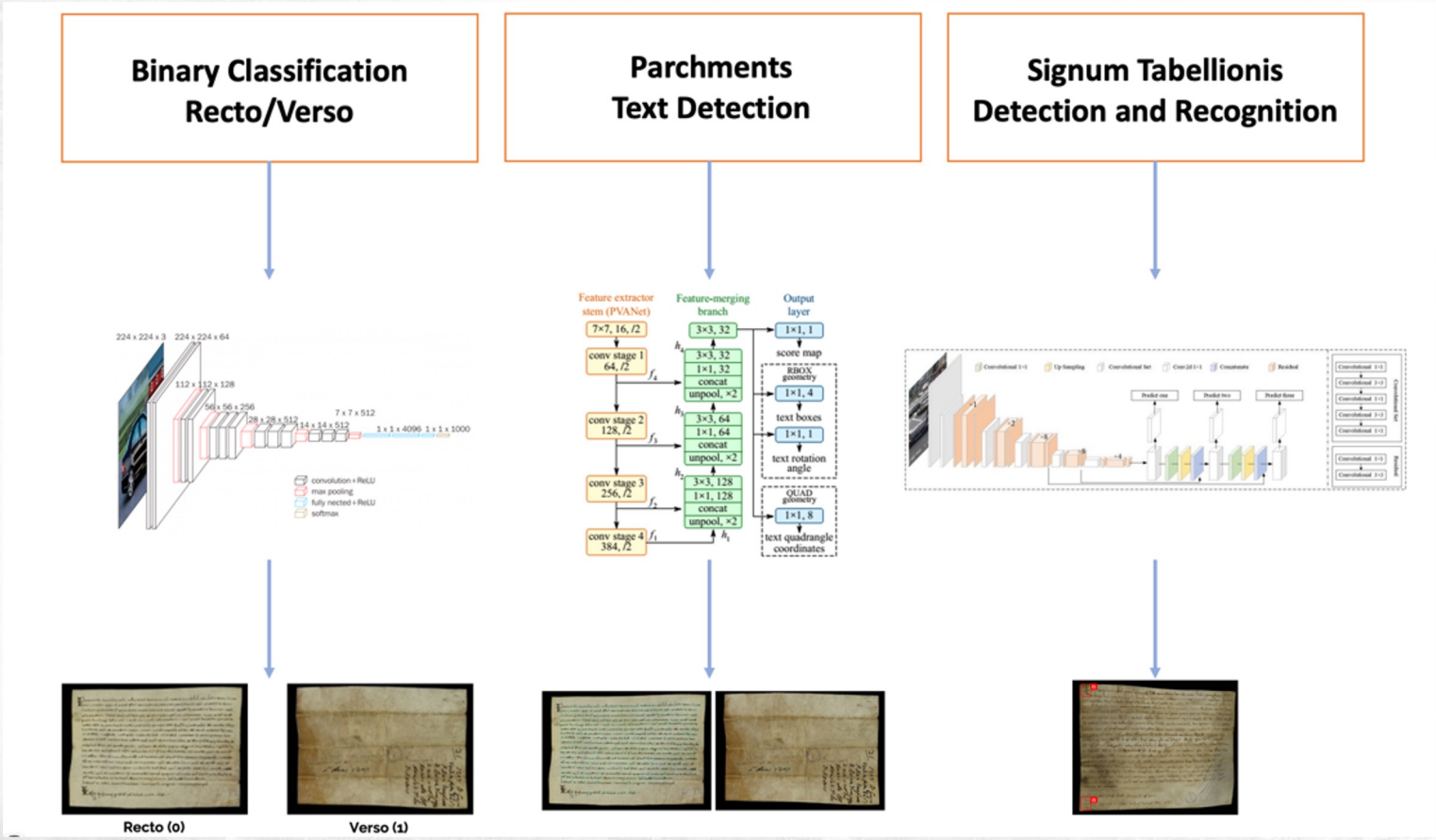
PergaNet *(from Pergamene per fondi)*

- All private deeds contain a *signum* - a special sign unique to each notary used to authenticate the deed
- Each signum is recognizable by shape, position, and so can be investigated across all these private deeds by AI - computer vision and deep learning

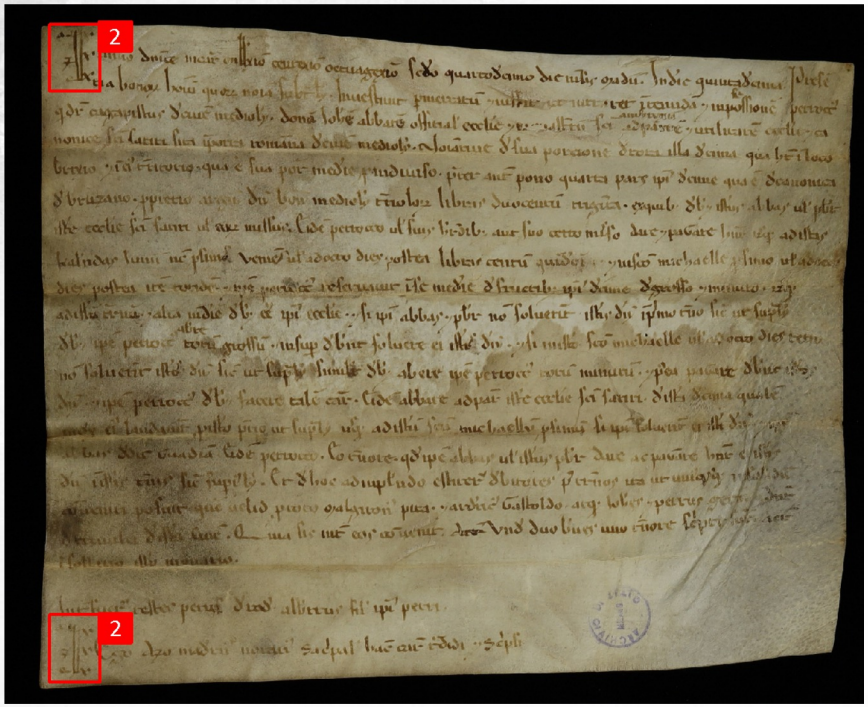


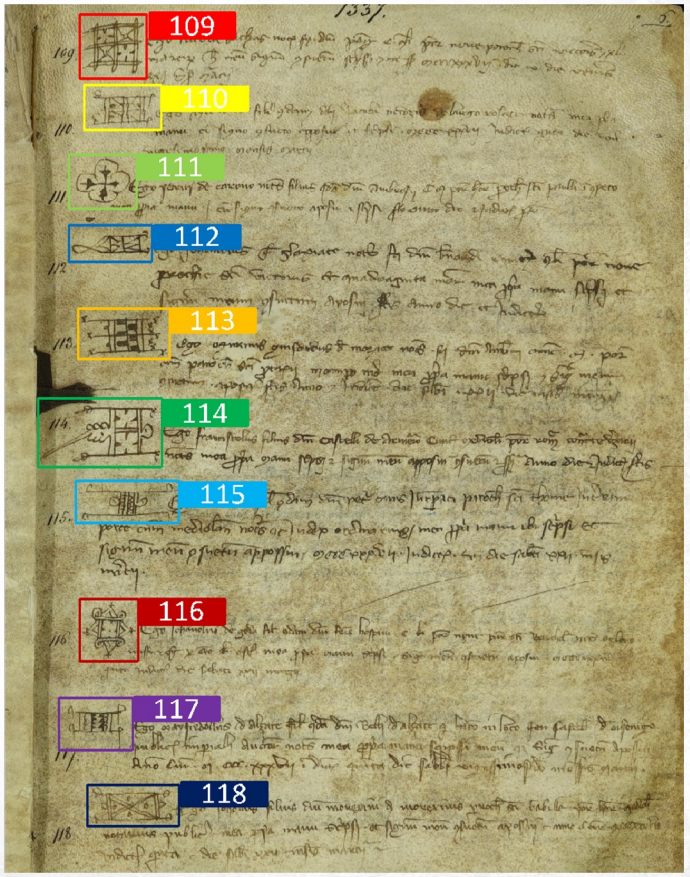
- PergaNet is a lightweight DL-based system for historical reconstruction of ancient parchments, providing automatic analysis and processing of large numbers of scanned parchments

PergaNet *(from Pergamene per fondi)*



PergaNet *(from Pergamene per fondi)*





2768 signa across deeds and fonds

PergaNet: wide applications

- Recognizing the individual system of writing of every single notary
- Training Handwritten Text Recognition tools to read text and abbreviations
- Analyzing archival notes on the back and recreating previous archival arrangements or uses of groups of documents
- Recognizing recurring images or other features in huge series of documents
- Identifying common patterns in manuscript maps or drawings

Paradata - what is it and why do we care?

If business is no longer to be transacted only by human beings, but also by AI agents, or some combination of the two, what will evidence of those transactions look like, what will the record be?

Jenny Bunn, InterPARES Researcher from The National Archives of the UK

Paradata is the information about the procedure(s) and tools used to create and process information resources, along with information about the persons carrying out those procedures.

ITrustAI working definition

RP04 Pat Franks, SJSU; Babak Hamidzadeh, U Maryland

Paradata & Metadata

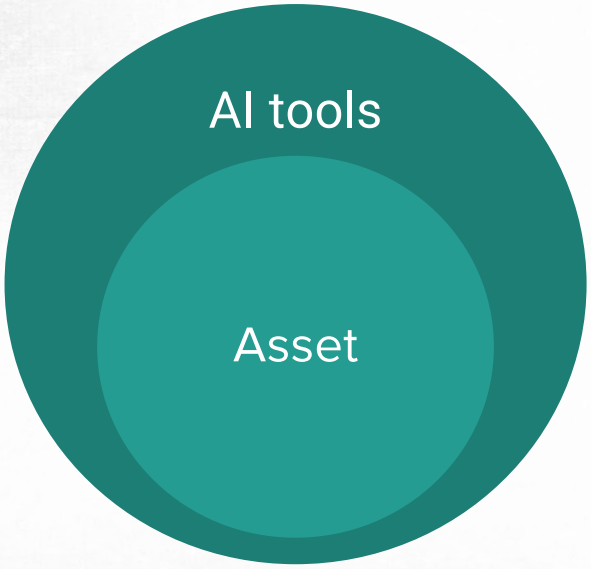
InterPARES TrustAI

AI tools - what might we need to know?

- AI Model (tested & selected)
- Evaluation & performance metrics
- Logs generated
- Model training data set
- Training parameters for model
- Vendor documentation
- Versioning information
- AI policy
- Design plans
- Employee training
- Ethical consideration
- Impact assessments
- Implementing process
- Regulatory requirements

Paradata: information about the AI

To document, describe, authenticate, manage



For insight, transparency, accountability

Record - what might we need to know?

- Author(s) (writers, addresses)
- Purpose, action
- Identifiers
- Archival bond(s)
- Contexts
  - Juridical, regulatory
  - Provenencial
  - Documentary
  - Procedural
- Classification codes
- Format(s)
- Rights, access restrictions
- Preservation requirements
- Etc.

Metadata: information about the asset

What about... *Digital Twins?*

- A digital twin is a set of virtual information constructs that mimics the structure, context, and behavior of a natural, engineered, or social system (or system- of-systems), is dynamically updated with data from its physical twin, has a predictive capability, and informs decisions that realize value. The bidirectional interaction between the virtual and the physical is central to the digital twin.

  The Committee on Foundational Research Gaps and Future Directions for Digital Twins, based on the American Institute of Aeronautics and Astronautics (AIAA Digital Engineering Integration Committee 2020)

- Goes beyond modeling and simulation because of the bidirectional feedback loop between a physical system and its virtual representation

TABLE 7-1 Key Gaps, Needs, and Opportunities for Scalable and Sustainable Digital Twins

Maturity	Priority
Early and Preliminary Stages	
Incentives and frameworks for comprehensive data collaborations, standardization of data and metadata (including across public data sets), and model collaborations are needed. Frameworks are needed that go beyond existing open science frameworks that largely rely on aggregating de-identified data into publicly accessible repositories.	1
Research Ongoing But Limited Results	
Existing literature and documented practices focus on the creation and deployment of digital twins; little attention has been given to sustainability and maintenance or life-cycle management of digital twins. Communities lack a clear definition of digital twin sustainability and life-cycle management with corresponding needs for maintaining data, software, sensors, and virtual models. These needs may vary across domains.	1

What about... *Digital Twins?*

- Carleton University's Sustain Digital Campus project is testing digital twins in several buildings, creating an ecosystem of technologies and data that allows Architecture, Engineering, Construction, and Operations professionals to analyze, visualize, and respond to real-time data to improve process and manage physical assets
- The ITrust AI case study:
  - seeks to understand how a digital twin is created and used so that it can be preserved
  - Will test the preservation of the Carleton U Digital Twin
  - Will determine if it is possible to use AI to automate the preservation of digital twins and related technologies

CU04 Digital Twins, Tracey Lauriault, Carleton University

What about... *Mulsemedia?*

- Generative AI currently produces synthetic multimedia documents, such as text, images, audio and video
- While multimedia generally encompasses video and audio content, mulsemedia (multiple sensorial media) includes haptic, gustatory, olfactory, and media including more than two senses
- Massive production of AI-generated multimedia and mulsemedia data is expected in the upcoming years
- Veracity and truth assessment tools, such as AI-generated detectors, will become increasingly critical for archivists and users of archives in the current and evolving context of digital data
- The field of records and archives currently lacks the tools to assess vast volumes of multimedia data. A new I Trust AI study is beginning to explore various aspects of data veracity, truth discovery of multimedia data, and the challenges emerging due to the novel AI generative techniques, in order to identify promising research directions and approaches.

GS04 Exploratory Study on Veracity and Truth Discovery of Multimedia Data in the Era of Generative AI, Michel Barbeau, Carleton University

UBC-NLP Lab and ITrust AI

- Serving diverse communities: expanding technological reach to archives in various languages not currently served by existing AI LLMs (like ChatGPT)
  - Step 1: Language identification (Babel-670 - a benchmark encompassing 670 languages across 23 language families and 5 continents)
  - AfroLID - a neural language identification toolkit for 517 African languages and dialects
  - Step 2: Natural Language Understanding (NLU) and Natural Language Generation (NLG)
  - Facilitates functions like Named Entity Recognition (NER) for classification, arrangement, and summarization for description and metadata enhancement
  - Speech processing and identification of PII; toxic language
- These are just two research areas underway

Muhammad Abdul-Mageed, Canada Research Chair in NLP and ML, co-director of ITrust AI and his team of post-doctoral researchers and students, UBC

InterPARES - trusting records regardless of technological change

- InterPARES 1 (1998-2001): preservation of authenticity of textual records, databases, in office management systems; perspective of preserver
- InterPARES 2 (2002-2007): authenticity, reliability, accuracy of records over their life cycle in artistic, scientific, government domains; perspective of creator
- InterPARES 3 (2007-2012): putting theory into practice
- InterPARES Trust (2013-1018): protecting record authenticity in the cloud
- InterPARES Trust AI (2021-2026): understanding and protecting record authenticity in the context of AI

Luciana Duranti, Principal Investigator of InterPARES, Co-director of ITrust AI, UBC

SSHRC CRSH

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Thank you!

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