Machine learning in systematic reviews: the hidden benefits of prioritised screening

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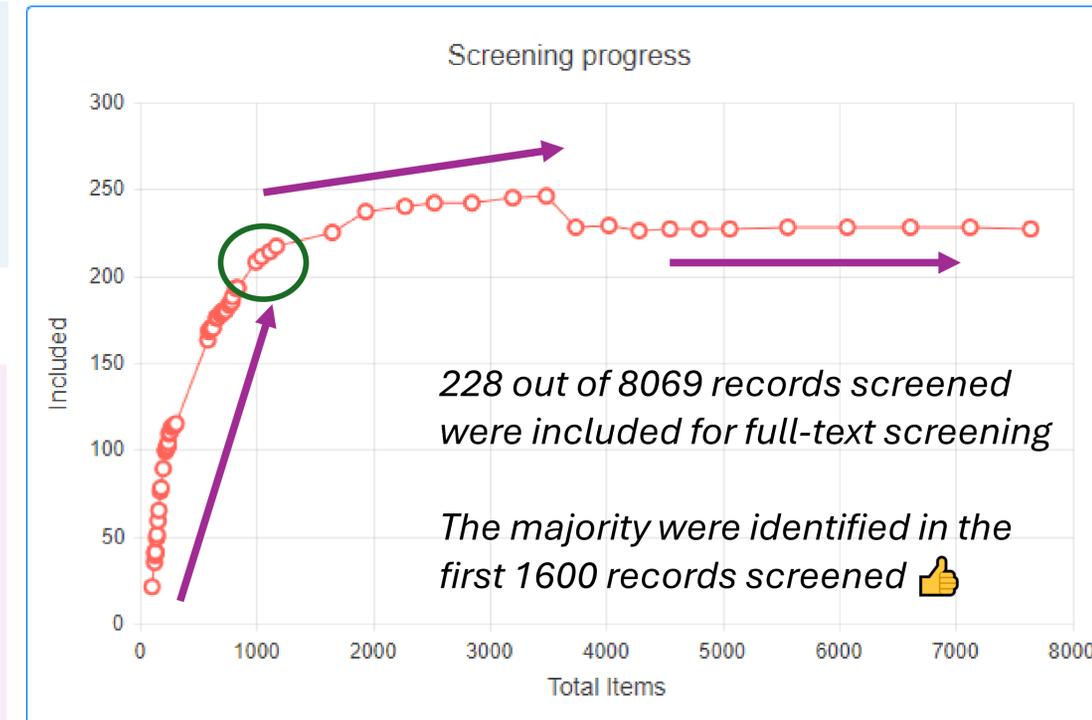
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Background and Motivation

- **Systematic reviews** summarise available evidence to address research questions
  - Often involve screening of titles & abstracts of records identified from searching databases
- **Prioritised screening** uses text-mining & machine learning technologies within review software to rank the relevance of research records
  - Bringing forward those **more likely** to be included in the systematic review for **classification by the reviewers earlier.**
- The process is **iterative**, as the algorithm learns how reviewers are applying eligibility criteria
- Records containing similar text **cluster** together and are presented to reviewers in **batches**

- Prioritised screening can **streamline & speed up** screening of research records, but there may be other **hidden benefits** and implications for the **overall systematic review process**

Methods

- **Aim:** To document the opportunities & challenges of using prioritised screening in systematic reviews

- **Context:** Systematic Review of Multi-Cancer Early Detection tests for general population screening using prioritised screening in EPPI-Reviewer software

Findings

- **8069 records** were identified in systematic searches of electronic databases

- First 10% of prioritised records were **double-screened**
  - Remaining records were **single screened**

- **Clusters** of similar and potentially relevant records were brought up earlier in the process allowing:
  - Early regular reviewer meetings to **reconcile** eligibility and discussion of queries
  - Expert **clinical advice** to be sought
  - **Clarification of review protocol**

Title and abstract inclusion rate

228 out of 8069 records screened were included for full-text screening

The majority were identified in the first 1600 records screened 👍

Impact

- Use of prioritised screening, leading to in-depth discussions early in the review process had a **positive impact** on
  - Overall team understanding of the research question
  - Designing data extraction forms
  - Writing up and interpreting results
- This was reflected in the quality and value of the final report

- York Evidence Synthesis Group intend to **routinely use prioritised screening** in future systematic reviews
- Further research will evaluate the types of reviews & review questions **likely to benefit most** from prioritised screening
  - And to highlight where the approach **may be less useful**

Timeline of systematic review stages

Review stage		Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
Protocol writing									
Searches performed									
Title and abstract screening	Pilot								
	Double screen, priority								
	Single screen, priority								
Full text screening	Full text retrieval								
	Double screen								
	Additional records								
Data extraction (pilot)									
Data extraction (inc. checks)									
Report writing									

Overlap of tasks was essential to the delivery of this project within the time frame 👍

References

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- Thomas J, Graziosi S, Brunton J, Ghouze Z, O'Driscoll P, Bond M, et al. EPPI-Reviewer:advanced software for systematic reviews, maps and evidence synthesis. London: EPPI Centre, UCL Social Research Institute, University College London; 2022.

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