Institute for Enterprise Systems
Empowering Digital Transformation

UNIVERSITY OF MANNHEIM

GUI2WiRe: Rapid Wireframing with a Mined and Large-Scale GUI Repository using Natural Language Requirements

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1. Motivation

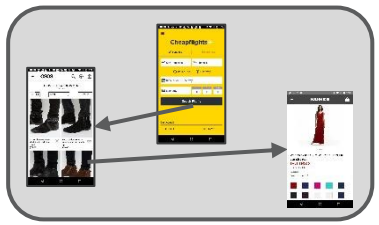
- Well-known and widely applied wireframing editors for GUI prototyping
  - … typically do not support GUI search via customer-friendly Natural Language Requirements (NLR)
  - … typically only provide few hand-crafted editable GUI templates or individual UI components

Goals:

Exploit large-scale (semi-automatically created) GUI repository

→ Enable quick and easy GUI retrieval via customer-friendly Natural Language Requirements

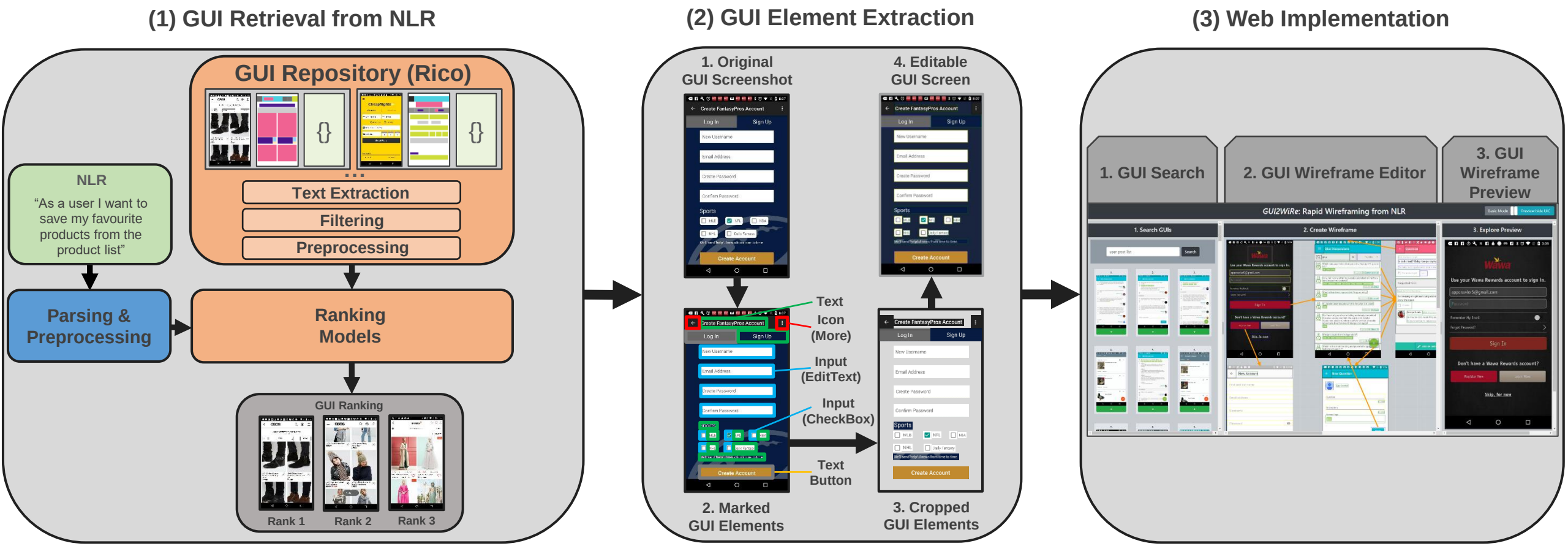
→ Automatically derive editable GUI templates for rapid wireframing



2. Related Work

- ***Balsamiq*** (low-fidelity) and ***Sketch*** (high-fidelity) are popular wireframing tools
  - → GUI search via NLR not supported
  - → GUIs created by combining individual UI components and few hand-crafted editable templates
- ***Guigle*** made the first attempt to devise a search engine for GUIs of mobile apps
  - → Simple GUI retrieval architecture
  - → Supports GUI search only – no GUI editing or wireframing capability
- ***Swire*** and ***GUIFetch*** enable GUI retrieval via hand-drawn sketches or Android app sketches
  - → No support for GUI retrieval via NLR

3. Approach: GUI2WiRe (1)

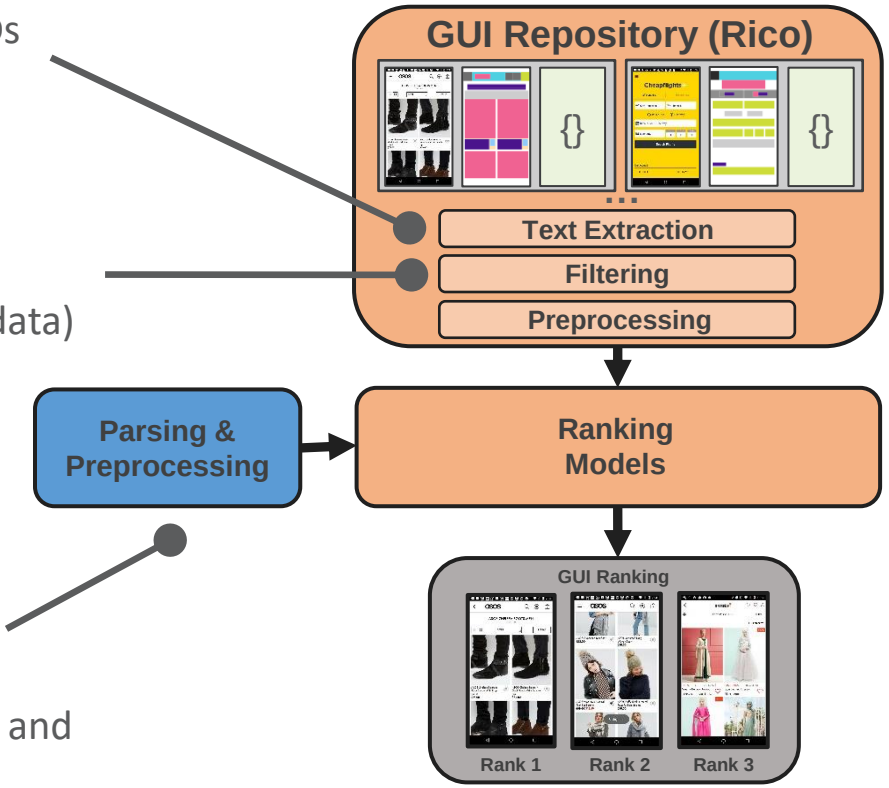


3. Approach: GUI2WiRe (2)

Text Extraction
- Extract displayed text and text hints
- Extract activity name and resource IDs
- Apply pipeline of tokenizers
- Apply custom stopword list

Filtering (54,476 GUIs remaining)
- Game GUIs (identified via app meta data)
- GUIs covered with advertisement
- Non-English GUIs (via Lang. Detec.)

Parsing & Preprocessing
- User Story Parser based on pattern matching (task desc. extracted)
- Lowercasing, Tokenization, Stopword and Out-Of-Vocabulary words removal



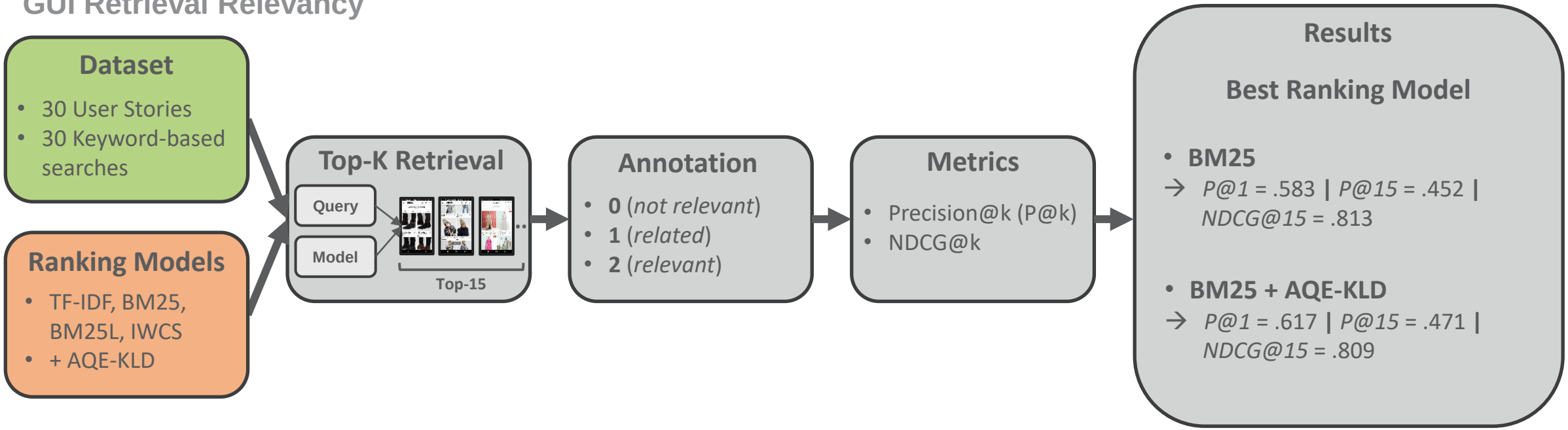
Advantages of Rico
- Large-scale (72,219 GUIs)
- Diversity of mined applications
- Rich textual information

TF-IDF, BM25, BM25L, IWCS

Automatic Query Expansion
Kullback-Leibler Divergence (KLD) Scoring

4. Evaluation

- **GUI Retrieval Relevancy**



- **Planned User Studies**
  - Evaluate practical usefulness with designers, developers and customers with use cases
  - Ask to create different wireframes and evaluate on dimension such as *ease of use*, *practicability, quality of produced wireframe* and *time required to create the wireframe*

5. Limitations

- Current evaluation is limited and GUI relevancy underlies subjectivity

  → Extend relevancy evaluation with multi-user approach

- Bag-of-Words (BOW) retrieval techniques neglect sequence of words and detailed semantics

  → Integrate Deep Learning based semantic retrieval approach

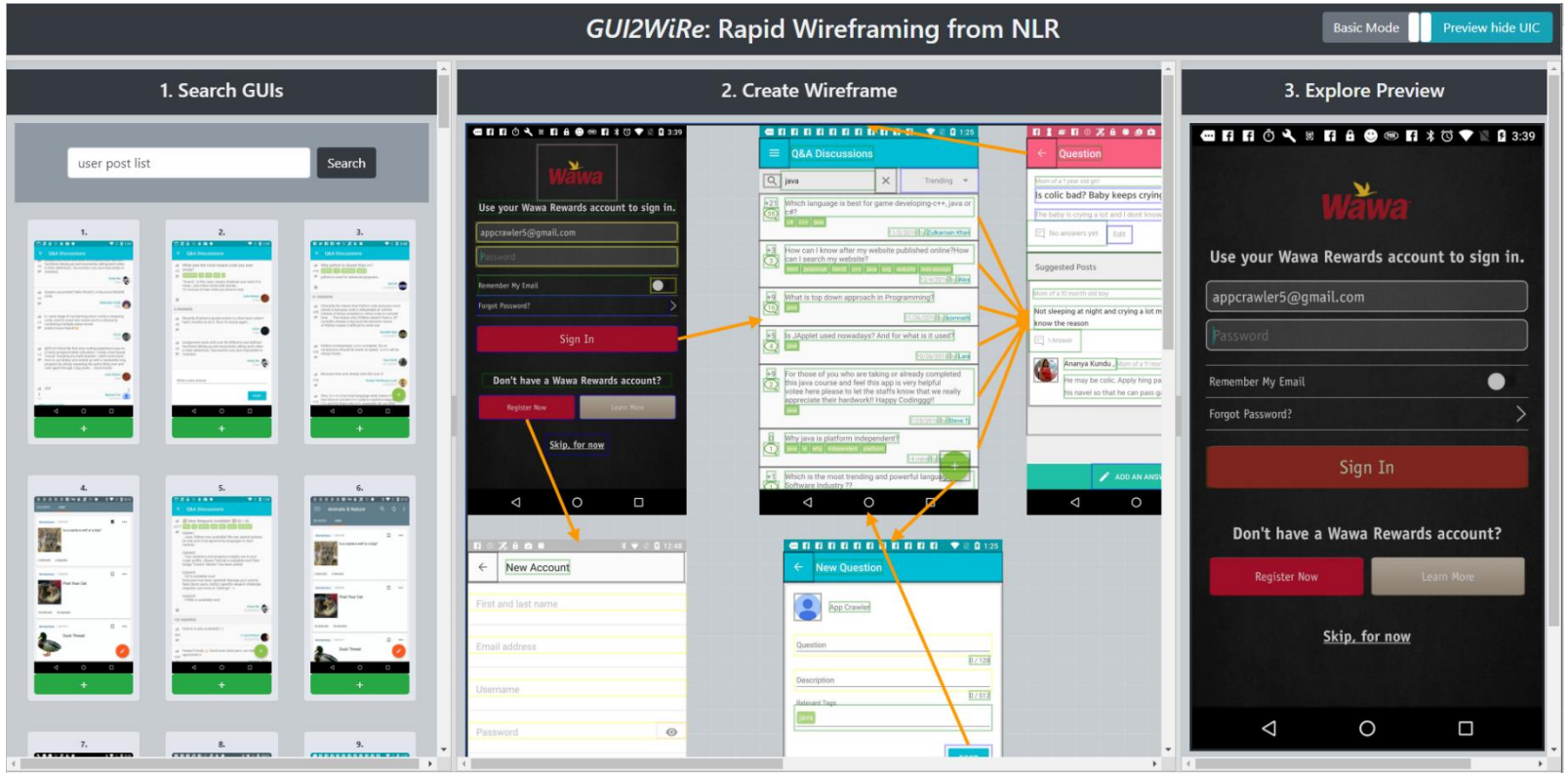
- Overall design of wireframe may not be cohesive

  → Automatic adaption and assimilation of design necessary

- Wireframes can not be exported currently

  → Plan to automatically generate Android project from the created wireframe

6. Conclusion



GUI2WiRe: A Rapid Wireframing Tool

- Exploit large-scale (semi-automatically created) GUI repository
- Enable quick and easy GUI retrieval via NLR
- Automatically derive editable GUI templates for rapid wireframing

kristiankolthoff.github.io/GUI2WiRe