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Towards Explainable RE Tools

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GI Fachgruppentreffen RE, Kaiserslautern
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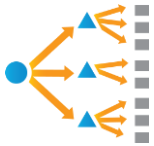
Automation and AI in RE

Problems

Categorization

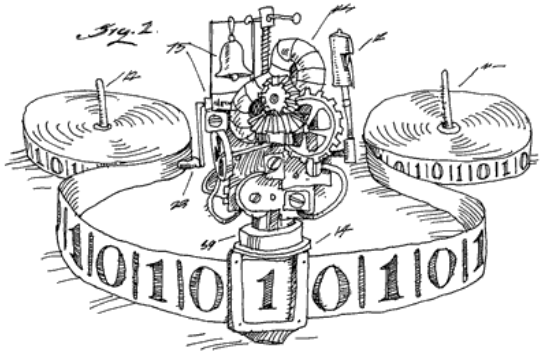


Traceability

Prioritization

Quality Assurance

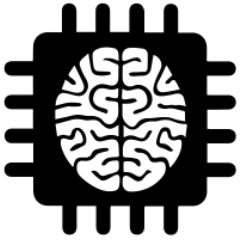
The Machine



Technologies

Natural Language Processing

Information Retrieval



Machine Learning

Automation and AI in RE

Automation and AI in RE

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Problems

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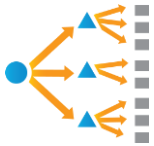

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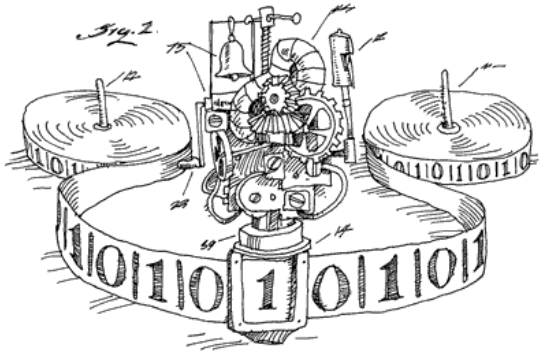


Why? Consequences?

The Requirements Engineer

Technologies

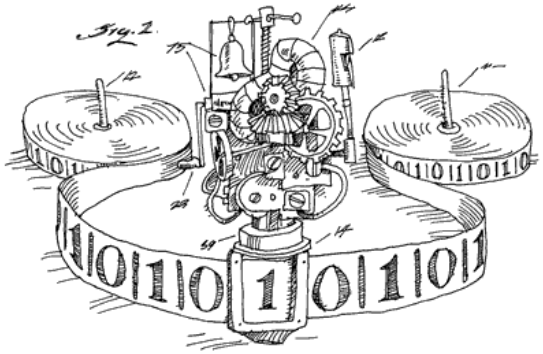
Natural Language Processing

Information Retrieval

Machine Learning

Message of this talk

The Machine



Why? Consequences?

The Requirements Engineer

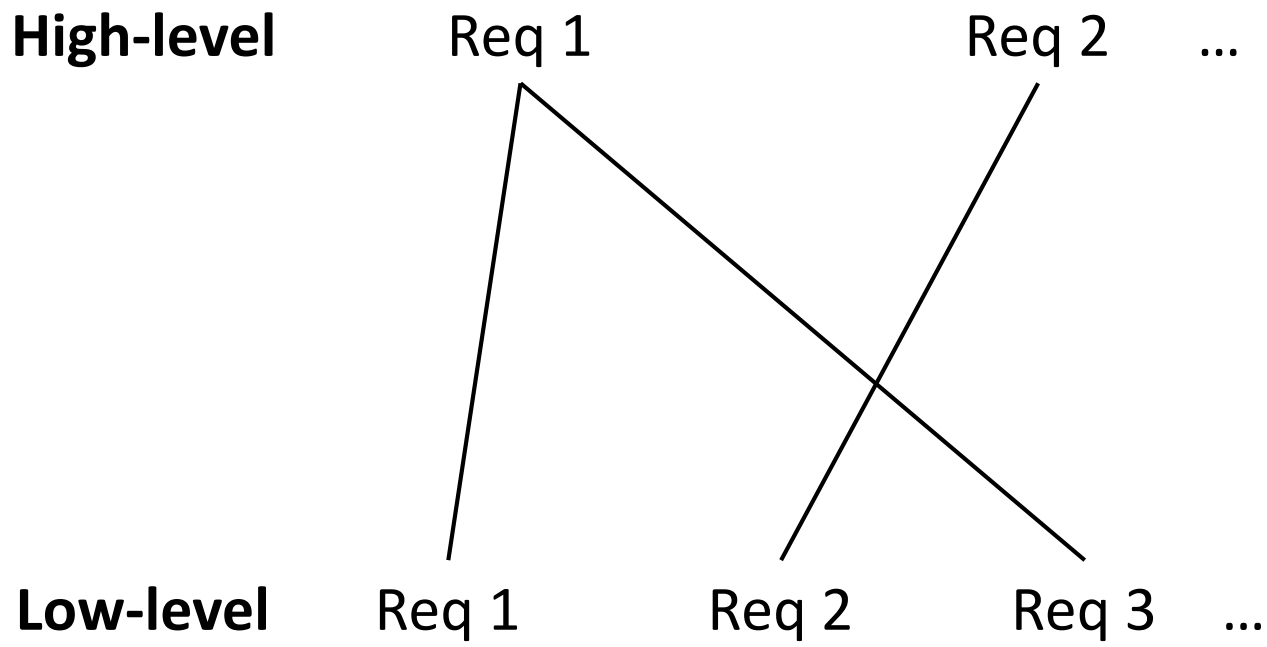
We need more research towards **explainable** and **actionable** RE tools.

Working Definition

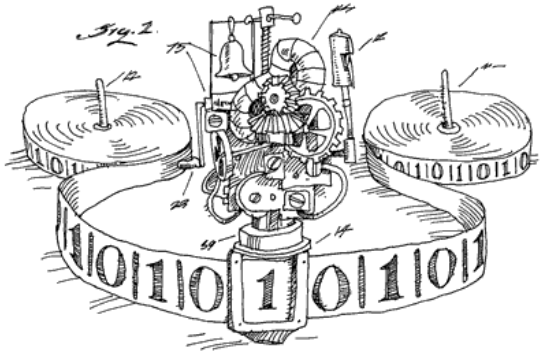
Explainable: The tool provides hints or indication on the rationale *why* the tool made a decision.

Actionable: The tool provides hints or indication on how the user can *influence* the decision by changing the processed data.

Example: Automated Trace Link Recovery



The Machine



Precision: 40%
Recall: 85%

J. Hayes, A. Dekhtyar, and J. Osborne: “Improving requirements tracing via information retrieval,” *RE’03*

Example: Automated Trace Link Recovery

High-level

Req 1

Low-level

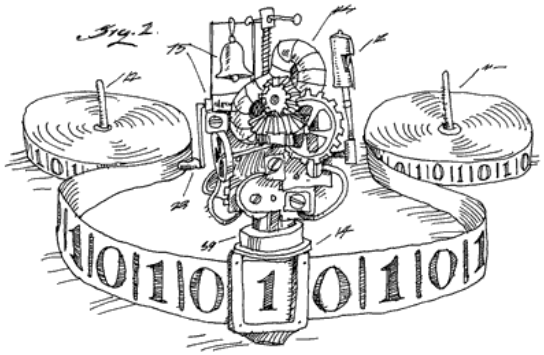
- ✓ Req 1
- ✗ Req 2
- ✓ Req 3
- ✗ Req 4
- ✓ Req 5
- ✓ Req 6
- ✗ Req 7
- ✗ Req 8
- ✗ Req 9
- ✗ Req 10
- Req 11

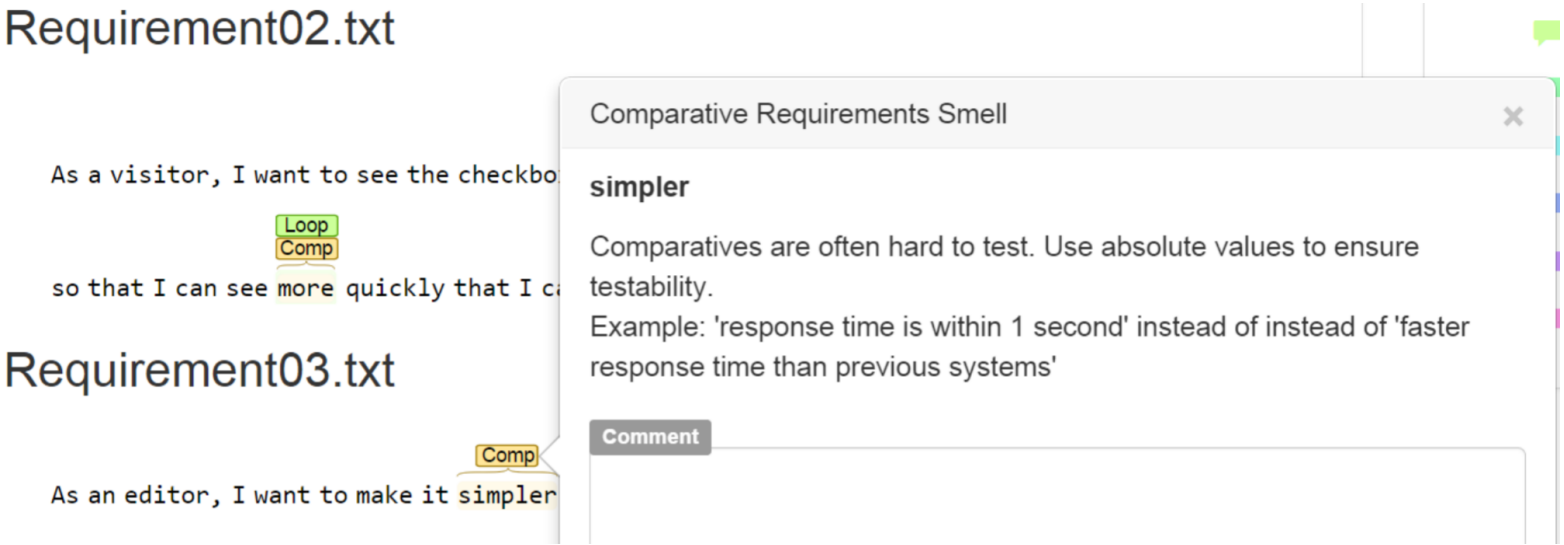
RE: Why is Req 2 related?
Tool: …
→ Not *explainable*

RE: Why is Req 11 not in the list?
What can I do to change that?
Tool: …
→ Not *actionable*

Towards Explainable RE Tools

Smell Name:	`Comparatives`
Entity:	Adverb, Adjective
Explanation:	Comparatives are used in requirements that express a relation of the system to specific other systems or previous situations.
Example:	The display (...) contains the fields A, B, and C, as well as **more exact** build infos.



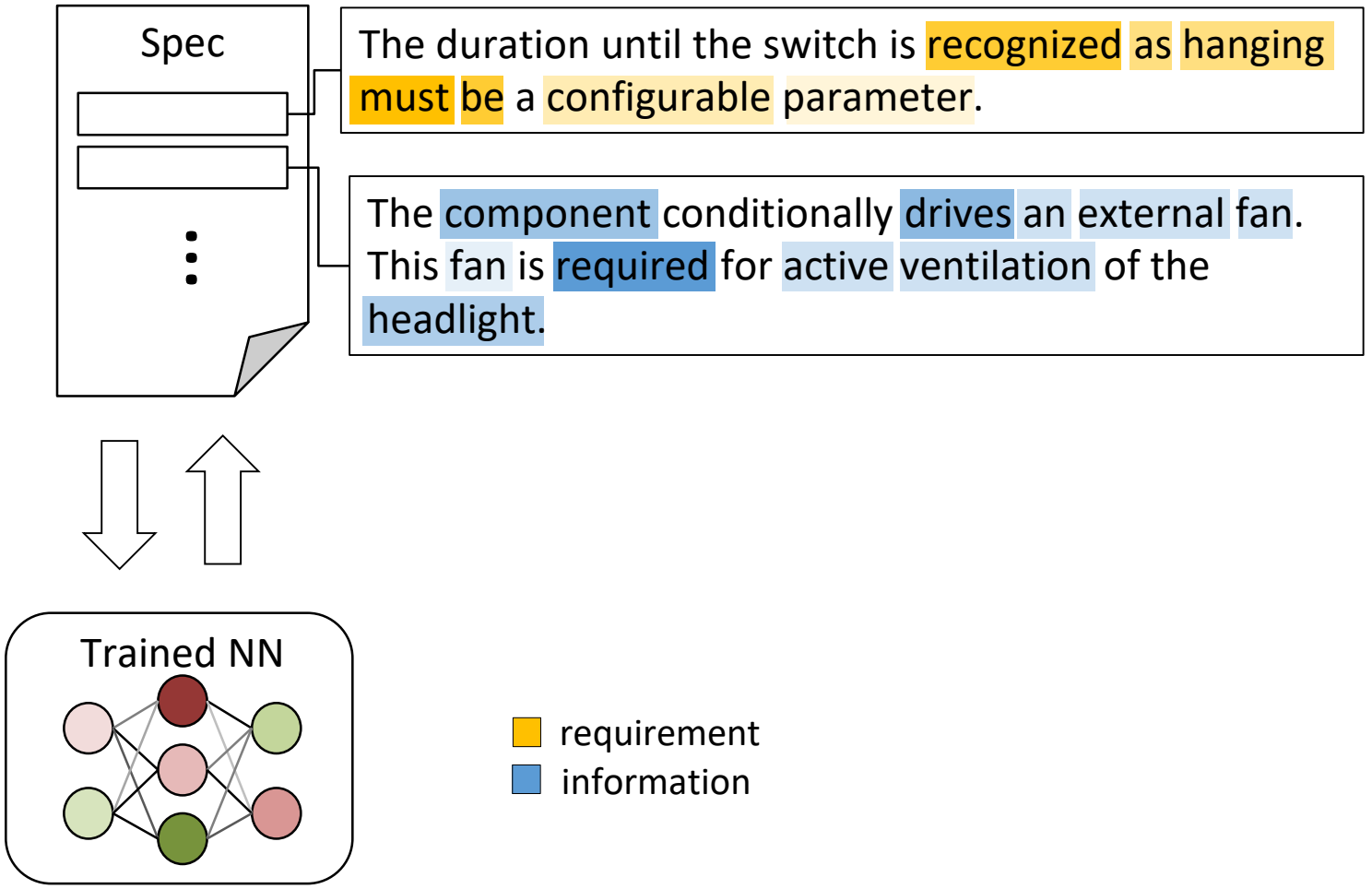


Femmer et al.: “Rapid Quality Assurance with Requirements Smells”, *JSS*, 2014

Towards Explainable RE Tools

- Scout Video

Towards Explainable RE Tools



Winkler, Vogelsang: "What does my Classifier Learn? A Visual Approach to Understanding Natural Language Text Classifiers", *NLDB'17*

Towards Explainable RE Tools

- LHAna Video

Beyond Explaining: Insights through Tools

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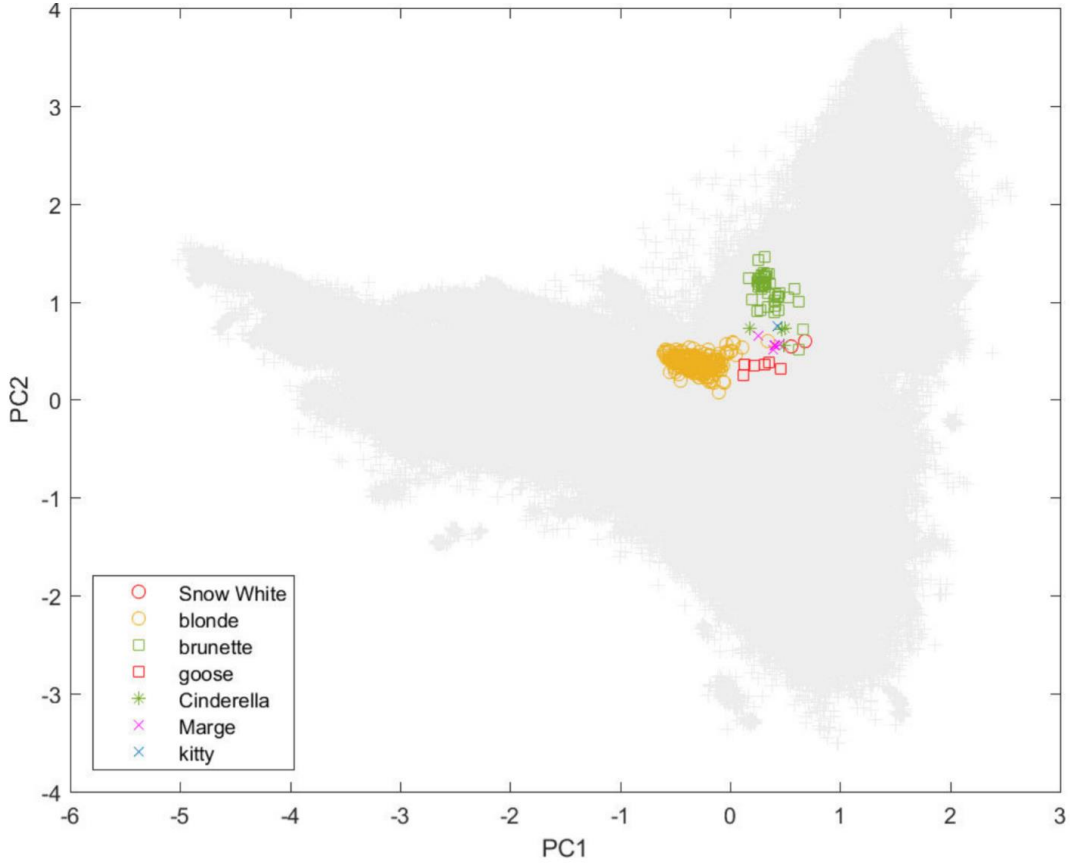
Using deep recurrent neural networks to learn and generate jokes (based on 11,000 unchanged jokes from the Internet)

Q: What do you call a car that feels married?

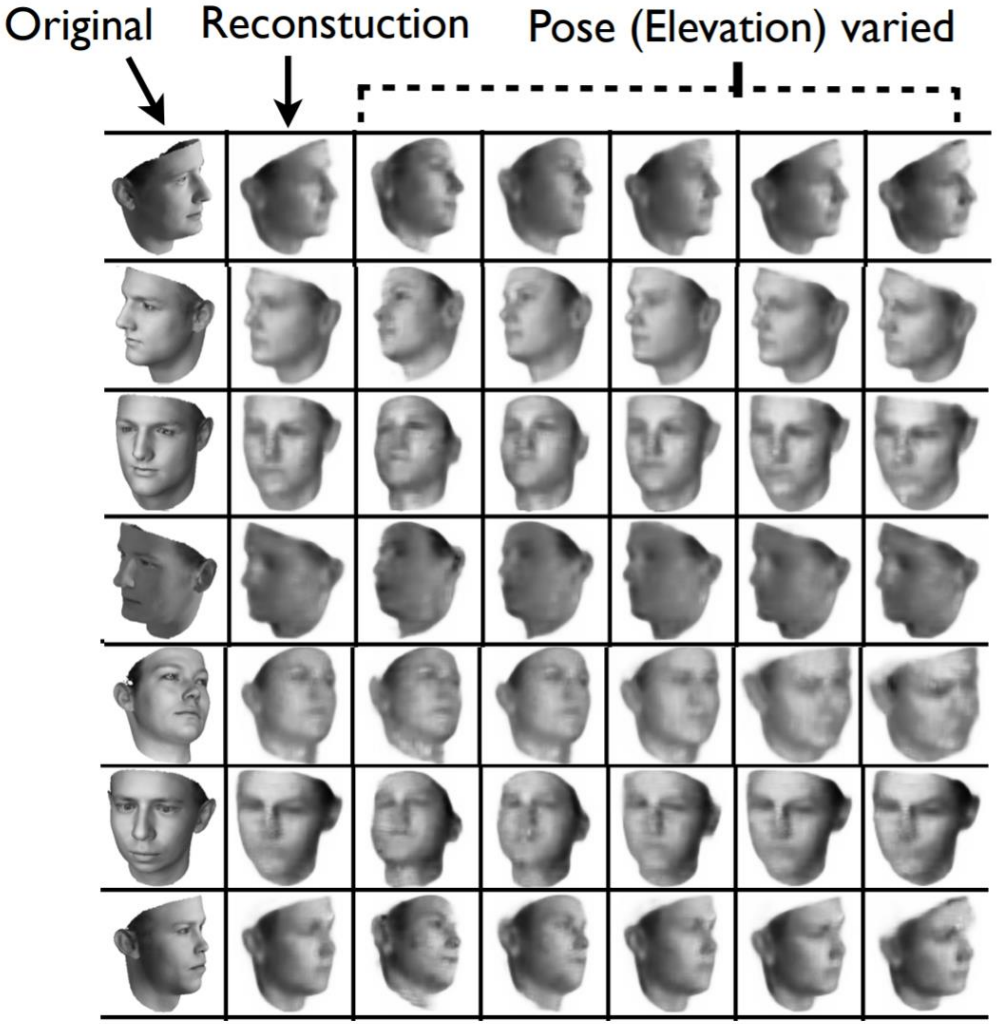
A: A cat that is a beer!



Bacciu et al.: “LOL: An investigation into cybernetic humor, or: Can machines laugh?” *FUN’16*

Beyond Explaining: Insights through Tools

Using Deep Convolutional Neural Networks to manipulate input data

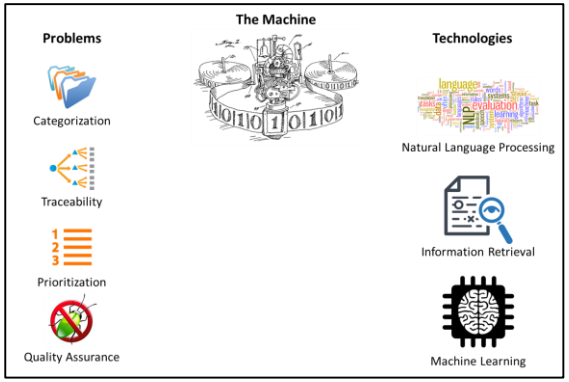


What kind of interpretable features would such a network learn on RE artifacts?

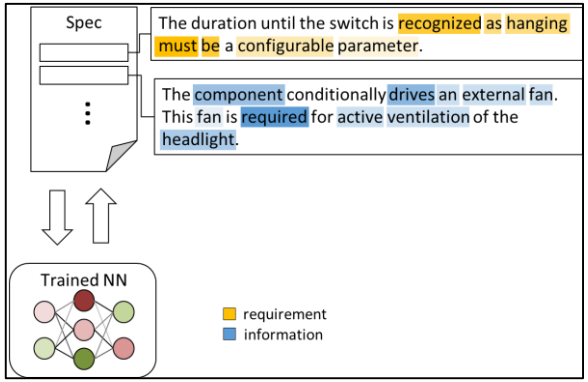
What use could we imagine for generated artifacts obtained by manipulating specific features?

Kulkari et al.: “Deep Convolutional Inverse Graphics Network“

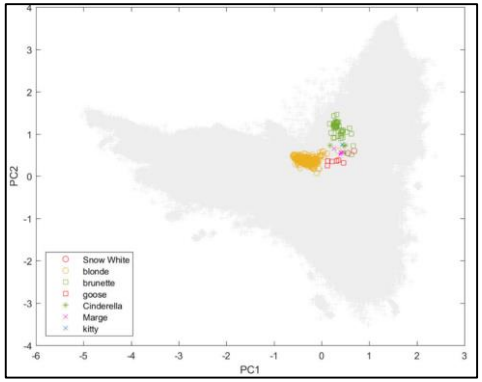
Summary and Conclusions



AI in RE



Explainable RE Tools



Insights through Tools

More research is needed towards **explainable** and **actionable** RE tools.

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