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DO WE KNOW OUR TD BETTER THAN AI?



Who is Antonio Martini?

Italian

- No kebab pizza! ☺
- 12 years in Scandinavia– survived many winters!

Previously

- Software Developer
- PhD in Software Engineering
- Postdoc
- Independent Consultant
- Principal, Strategic Researcher at CA Technologies (now Broadcom)
- 12 years of research and practice on technical debt

Hobbies

- Board games, strategy computer games, pool, etc.
- Football, volleyball, beach volley, fencing
- Piano, Drumset, etc.
- Travel!
- ...and no time for them! ☺



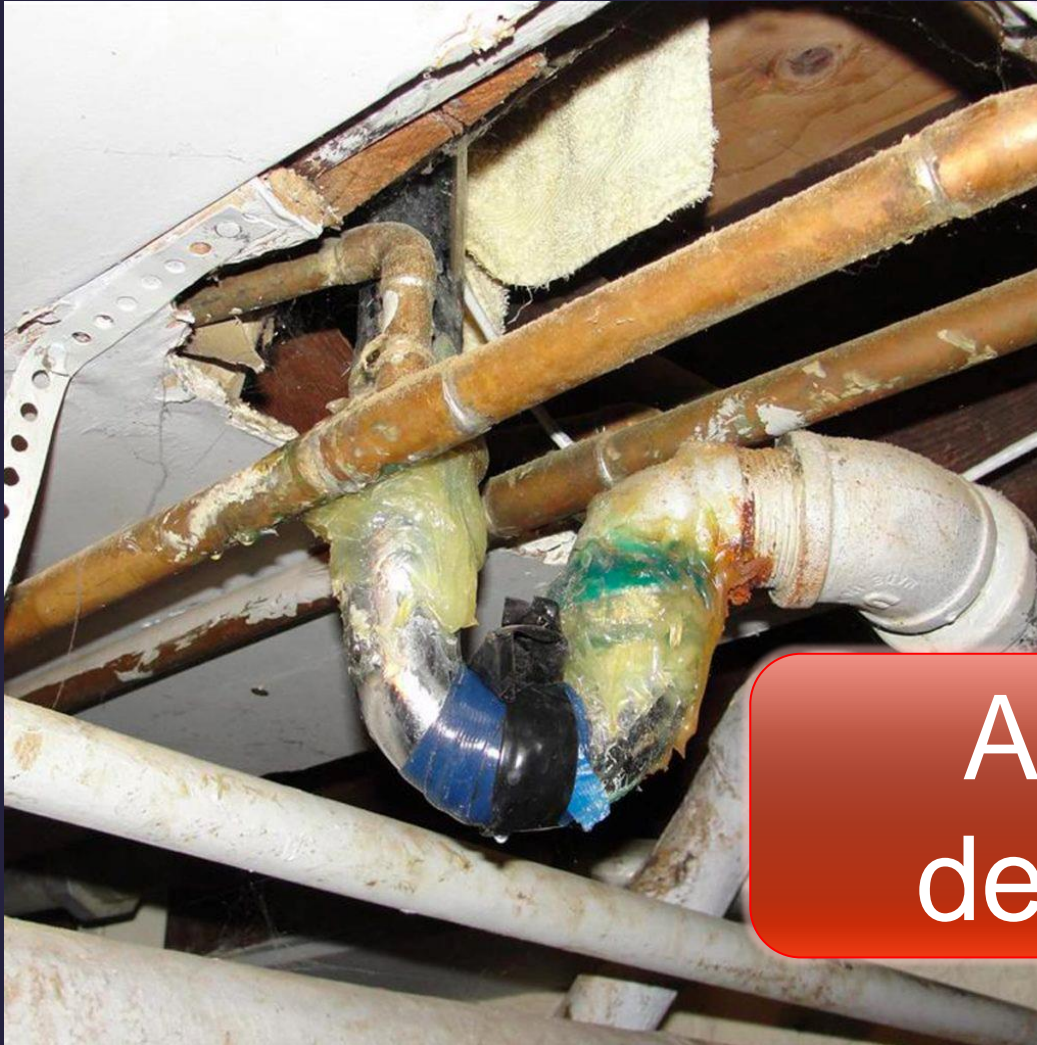
What is technical debt?

What the users see



Wonderful
features!

What the developers see



Awful
design!

TechDebtOps – A 3-year project funded by the Research Council of Norway

**Data-driven continuous
management of technical debts
for sustainable software
development**

AKVAGROUP™

knowit

 **VISMA**

VOLVO



SAAB



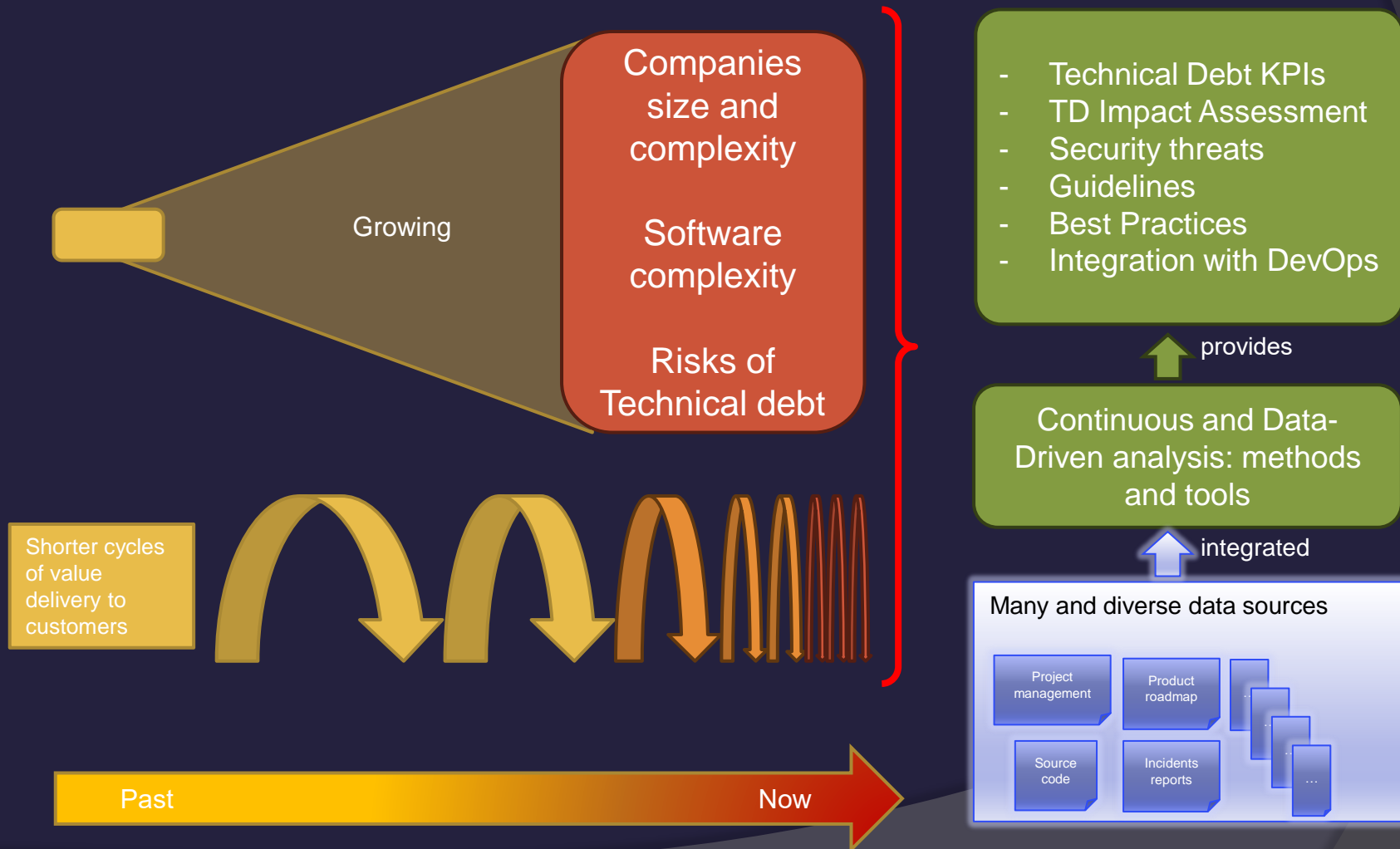
ca
technologies

SIEMENS

Nordea



Challenges and goals of technical debt



AI trends

- ◎ Current trends in AI
 - Large Language Models (**LLMs**)
 - **Transformers**-based (fast-)training



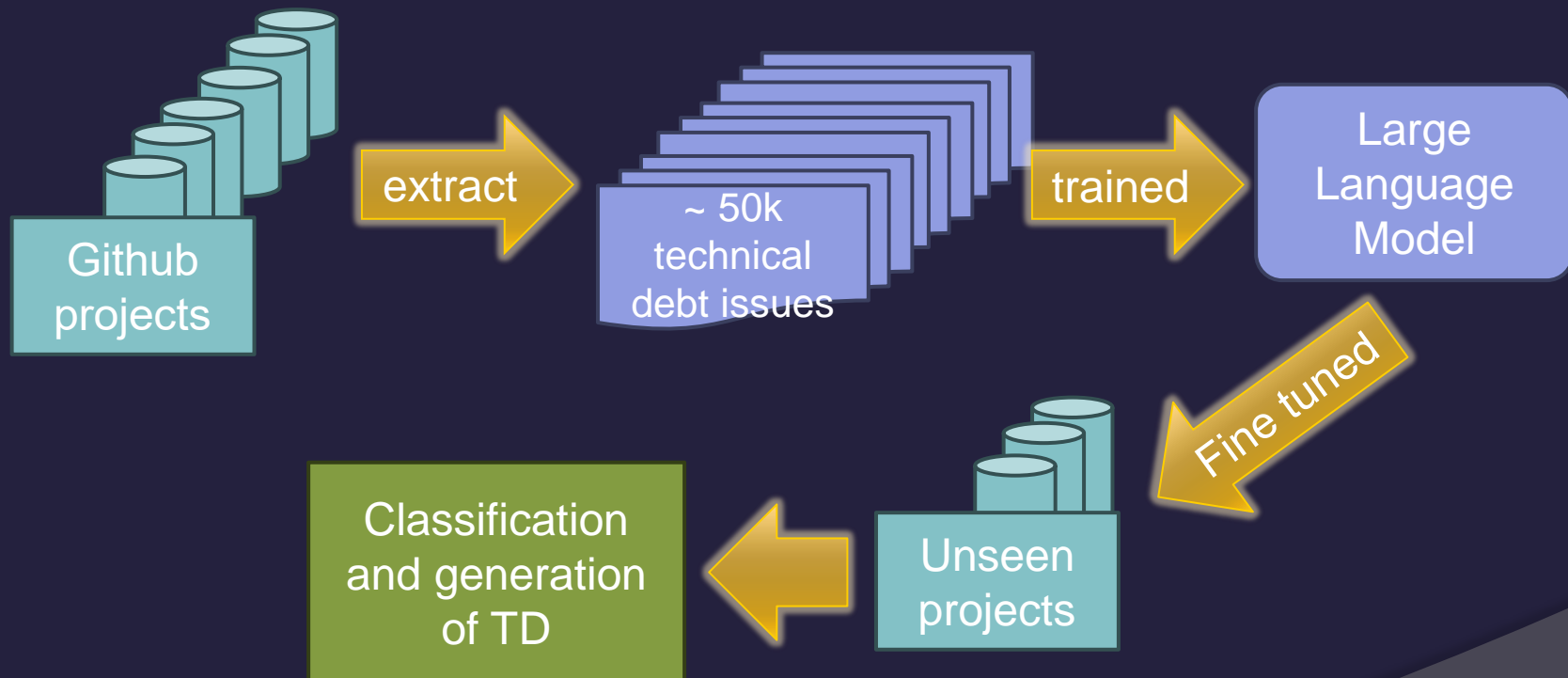
Generative AI for software development

- ◎ Why LLMs in software development?
 - Many past (and limited) approaches are often based on **one specific data source only**
 - E.g. Code repo analysis
 - We need more **context!**
 - A lot of the context is encoded in documents using **natural language**



(semi-) automatic tracking TD: ML-based recognition of TD in github issues

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* D. Skryseth, K. Shivashankar, I. Pilán and A. Martini, "Technical Debt Classification in Issue Trackers using Natural Language Processing based on Transformers," *TechDebt 2023*

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Classification of TD in github issues

A screenshot of a GitHub repository's issue tracker. The top bar shows 130 Open issues and 659 Closed issues. Below the bar, a list of issues is displayed. Each issue has a title, a status (e.g., 'opened 2 weeks ago'), and a set of labels. The labels 'tech debt' are highlighted with red boxes in the following issues:

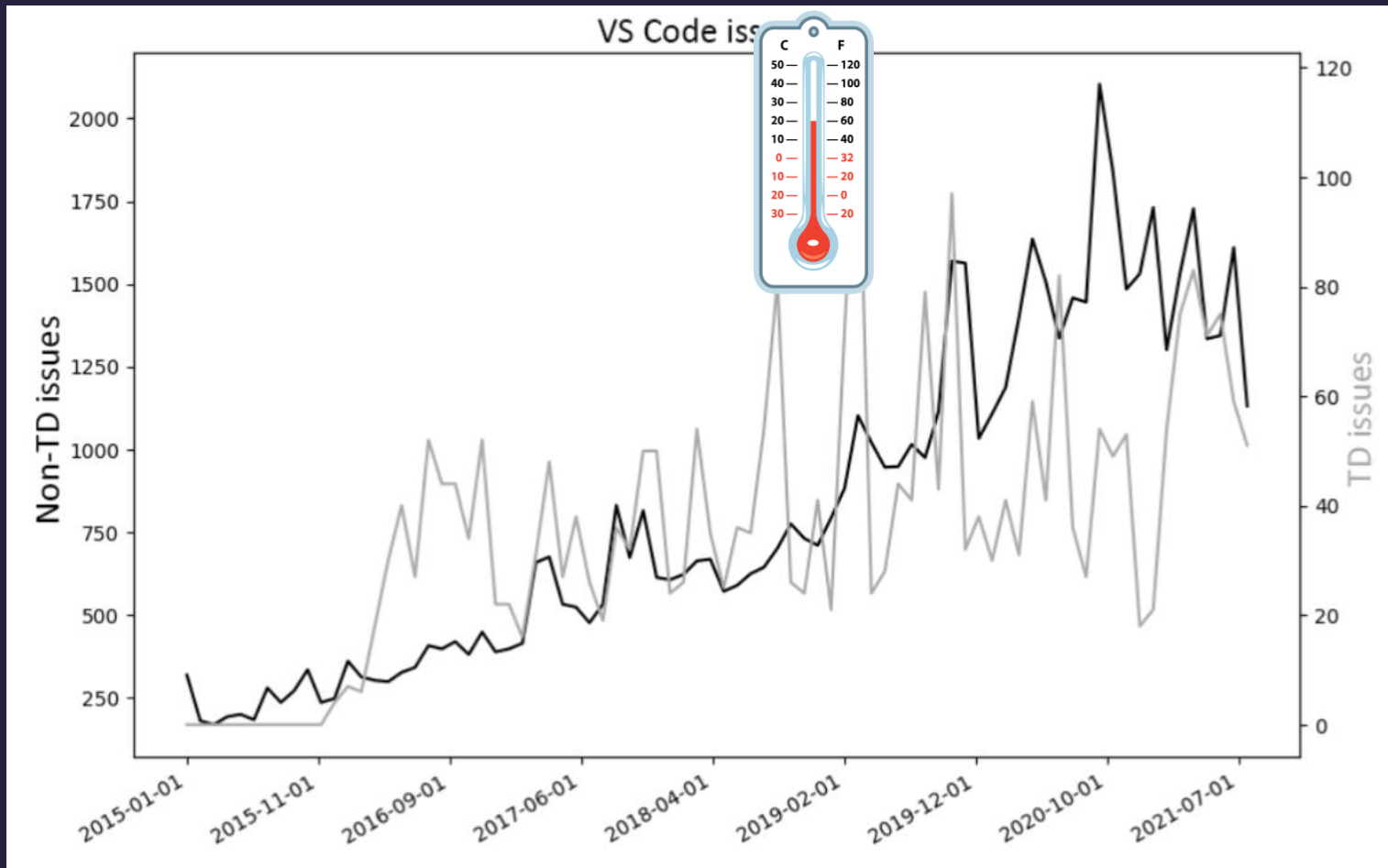
- Issue #7829: **t3c remove perl dependency and references** (opened 2 weeks ago by jpappa200). Labels: ansible, improvement, tech debt, unused code.
- Issue #7739: **Fix parameters permission conditional** (opened on Aug 22 by ericholguin). Labels: low impact, tech debt, Traffic Ops.
- Issue #7654: **Ansible Playbooks should upgrade to APIv4** (opened on Jul 18 by rimashah25). Labels: ansible, high impact, improvement, medium difficulty, tech debt.
- Issue #7653: **Remove Traffic Ops APIv3** (opened on Jul 18 by rimashah25). Labels: improvement, medium difficulty, tech debt, Traffic Ops.
- Issue #7193: **Refactor by renaming CCR to Traffic Router/TR** (opened on Nov 14, 2022 by rimashah25). Labels: tech debt.
- Issue #7189: **Testing Delivery Services are not full representations** (opened on Nov 14, 2022 by ocket8888). Labels: low difficulty, low impact, tech debt, tests, TO Client (Go).
- Issue #7015: **Add blueprint for a Global Configuration object** (opened on Aug 11, 2022 by ocket8888). Labels: blueprint, tech debt.

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We can monitor technical debt in a more context-dependent way



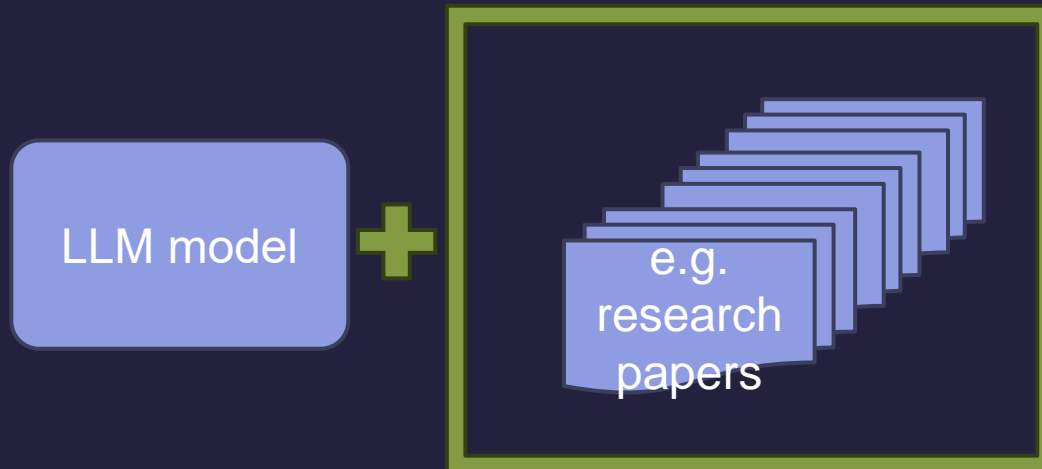
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Technical debt guidelines with AI

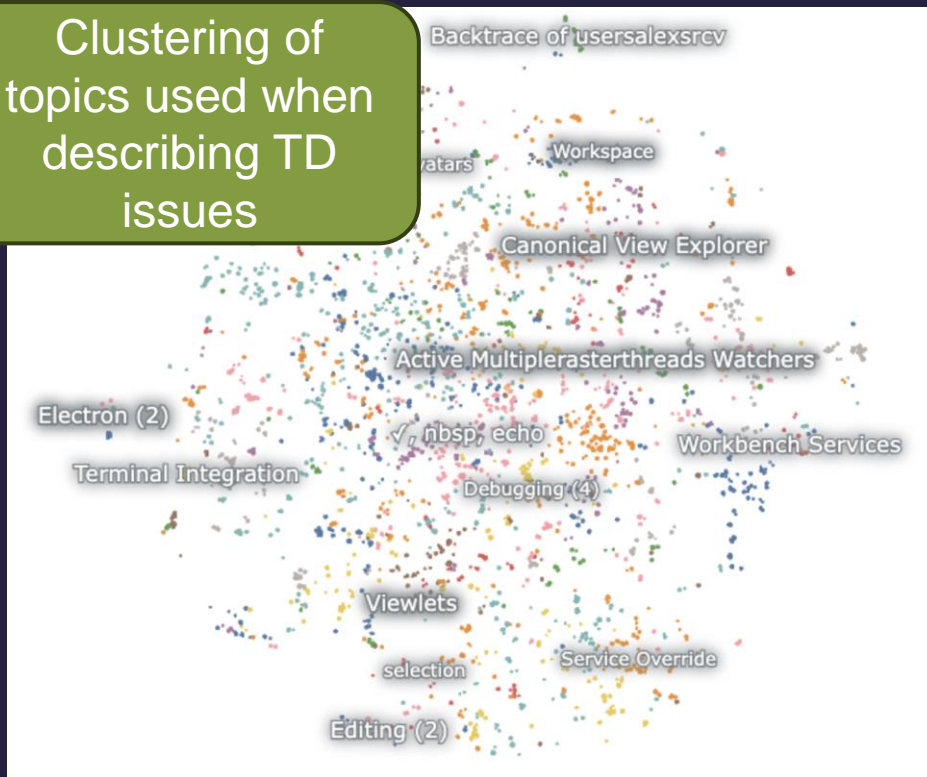
- LLMs fine-tuning or retrieval augmented generation
 - **reliable** sources



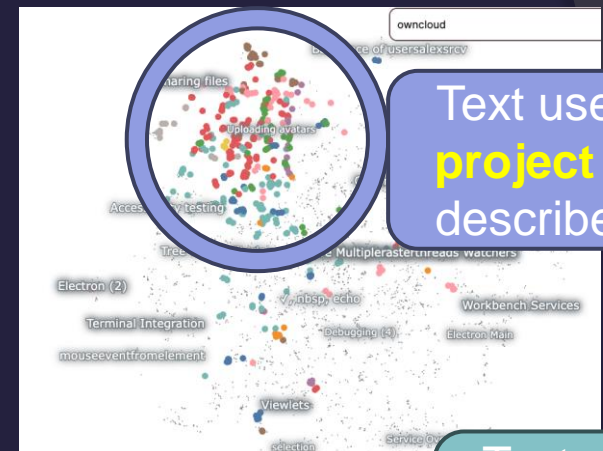
TD visualization with AI

🕒 Different context = different TD

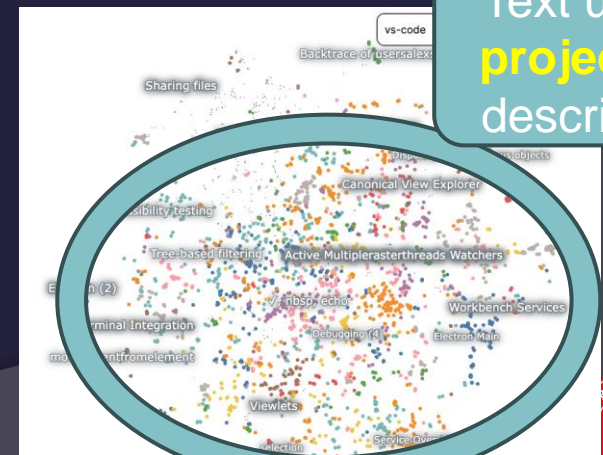
Clustering of topics used when describing TD issues



Text used in **project A** to describe TD



Text used in **project B** to describe TD



Questions?

Comments?

- References:

- For further information:
 - antonio.martini@ifi.uio.no

