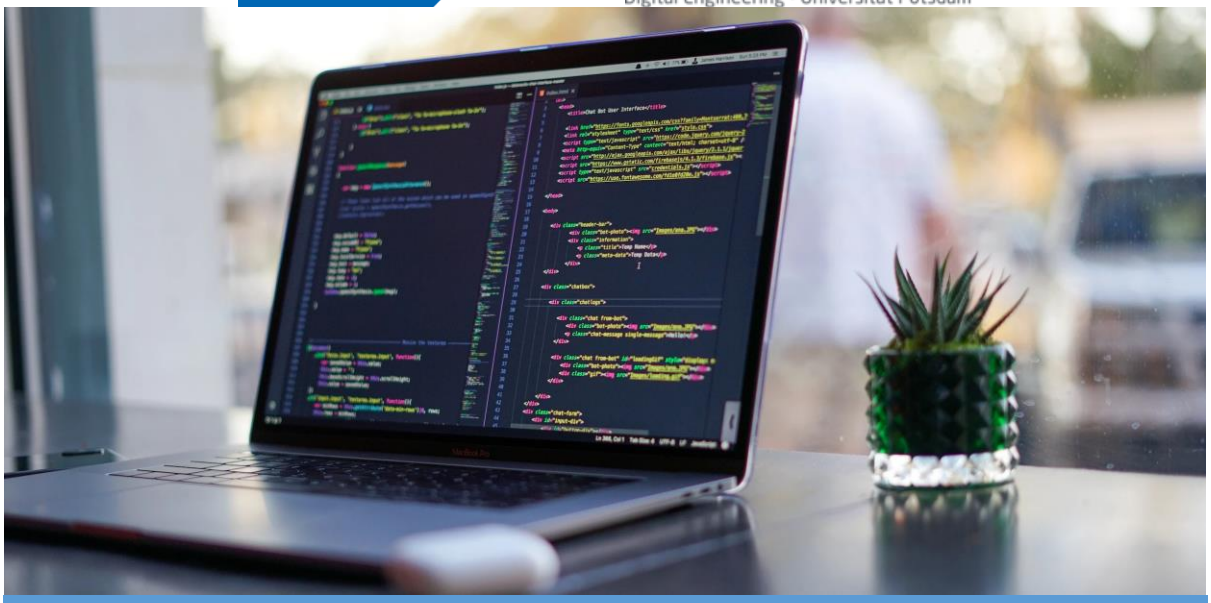

Feedback-2-Code

Proposing Code Changes from Customer Feedback

Bachelor project for 2023/2024
Departments of Artificial Intelligence and Sustainability / Intelligent Systems
Prof. Dr. Ralf Herbrich and Prof. Dr. Gerard de Melo

Motivation. AI systems such as ChatGPT and GitHub CoPilot have changed the way many software engineers develop code. Recent models not only offer intelligent autocompletion but are also able to follow instructions to generate or adapt code. However, they operate at a local level without knowledge of the overall code base and often require very specific instructions about the desired changes to the code.

Our partner SAP (*Systems, Applications, and Products*) is a leading enterprise software company that has revolutionized the way businesses operate and manage their processes. With its comprehensive suite of integrated applications – including SAP S/4HANA for ERP (Enterprise Resource Planning), SAP SuccessFactor for HCM (Human Capital Management), and SAP Concur for cloud-based travel and expense management – SAP enables organizations to streamline their operations, enhance productivity, and gain valuable insights to make informed decisions.

All these solutions have grown into complex software development projects spanning millions of lines of code, developed by many thousands of SAP software developers around the world. To get direct feedback from customers about feature and change requests, SAP embedded Qualtrics into their software, which resulted in hundreds of thousands of customers' input. However, the current volume of feedback outpaces SAPs development capacity to simultaneously address all of these requests.

To tackle this challenge, this project will develop and integrate Generative AI solutions that can support the entire development process from the first customer feedback down to changed source code artifacts implementing related feature requests.

Solution Approach. In the proposed project, we will solve two related problems:

1. First, we will use a large language model (e.g., GPT4), to develop prompts that generate code in a common intermediate language (e.g., Java), which matches *actual* code changes that were performed in the SAP code base after cross-compilation from the common intermediate language to the SAP-internal programming languages and frameworks (e.g., ABAP, SAP CAP). This yields training data for Step 2 in the form of tuples (*customer feedback*, *GPT4 prompt*) of customer feedback and the matching GPT4 prompt that generates an appropriate code change in a common intermediate language.
2. Using the dataset from Step 1, we will develop an algorithm/train a model that computes the correct GPT4 prompt from the customer feedback. In this step, particular attention must be paid to the loss function used when learning the mapping or in other words, we need to ensure that all prompts that generate correct code are considered correct; in contrast to "vanilla" learning algorithms, this might involve code simulation in a sandbox for generating appropriate loss function values in the machine learning step.

Data & Technologies. In this project, we will use an SAP-internal customer feedback dataset as well as samples from code changes and issues from past code changes (as a result of customer feedback). The dataset covers a timespan of around two years of customer feedback. For analysis, we will make use of Python and PyTorch. One starting point of algorithms will be Transformer models.

Project Partner. SAP is already experimenting with large language models to (semi-)automate the process of code generation from textual task descriptions. Our partner, coordinated by Dr. Michael Perscheid, the (former) HPI chair representative of Prof. Plattner, has already collected customer feedback data and is deeply familiar with our infrastructure and HPI bachelor project setup at HPI. For more information about the partner, please email michael.perscheid@sap.com.

For more information about this Bachelor project please email ralf.herbrich@hpi.de and Gerard.DeMelo@hpi.de. We will have weekly meetings with the project partner to both receive feedback and present project progress.

Please Note: As you will work with a lot of internal SAP material, it is necessary that project students sign a Non-Disclosure Agreement (NDA) with SAP. If you have questions, please reach out to michael.perscheid@sap.com.