CoRet: Improved Retriever for Code Editing

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Boost Code Retrieval for Code Editing with

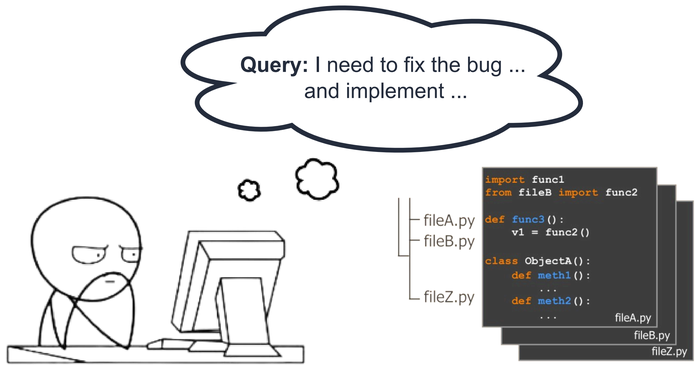
Repo Hierarchy-Aware Chunking

Call Graph Context augmentation

Likelihood loss based training

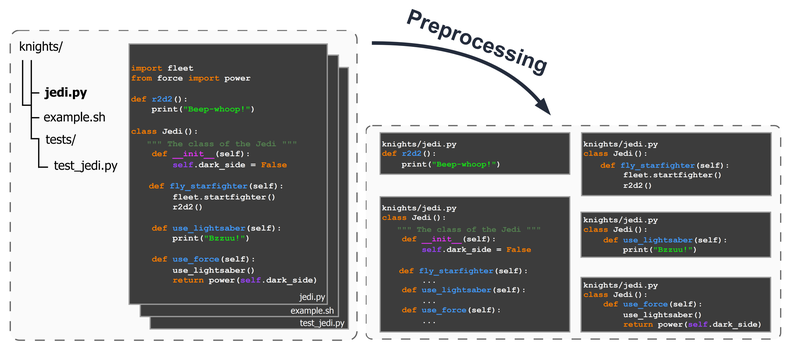
Check out the paper!

Code Editing Retrieval Problem



Which parts of the repo should you retrieve for editing?

Code Chunks with Repo-Hierarchy



The code repo is split into semantically succinct unit we called **code chunks**.
We include **repo-hierarchy** structure by including the file path string.

Embedding with Call Graph Context

$$c_i \; ; \; \texttt{[DOWN]} \; ; \; c_{out}$$

The chunk of interest c_i is concatenated as context with the out-going chunk c_{out} from the call graph and special token `[DOWN]`.

Training with Likelihood Loss

$$\mathcal{L}(\theta) = \frac{1}{N} \sum_{i}^{N} \frac{1}{\mathcal{C}_i^*} \sum_{\boldsymbol{c}^* \in \mathcal{C}_i^*} \log \frac{\exp(\boldsymbol{q}_i \cdot \boldsymbol{c}^*)}{\exp(\boldsymbol{q}_i \cdot \boldsymbol{c}^*) + \sum_{c \in \mathcal{B}} \exp(\boldsymbol{q}_i \cdot \boldsymbol{c})}$$

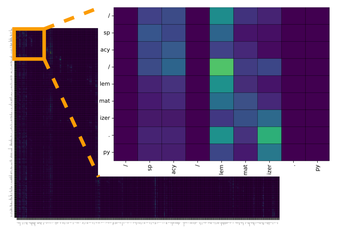
N = Number of repo instances i, $\mathcal{C}^*$ = Set of ground truth code chunks c^*, $\boldsymbol{q}$ = Natural Language query,
$\mathcal{B}$ = Random negative sample in the same repo instance.

Call graph improves multi-chunk retrieval

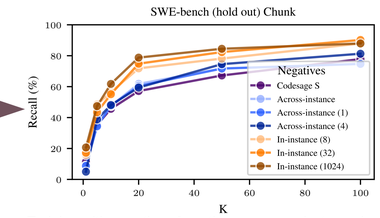
	SWE Verified			LCA		
Model	@5	@20	MRR	@5	@20	MRR
CodeSage S	0.34	0.51	0.35	0.26	0.34	0.28
CoRet − CG	0.52	0.69	0.52	**0.32**	0.41	0.45
CoRet − CG + file	**0.54**	0.69	0.52	0.29	0.38	0.44
CoRet	**0.54**	**0.71**	**0.53**	**0.32**	**0.47**	**0.47**

CoRet: Fine-tuned CodeSage S (130M parameters).
SWE Verified: Software Engineering Benchmark (Verified subset).
LCA: Long Code Arena (Bug localisation task).

Repo-hierarchy is important



Negatives from the same repo are best



Training with negatives from the same repo instance improve over negatives across repo instances (standard *in-batch* negatives).

Recall +15 percentage points