

Interactive learning tool utilizing AI

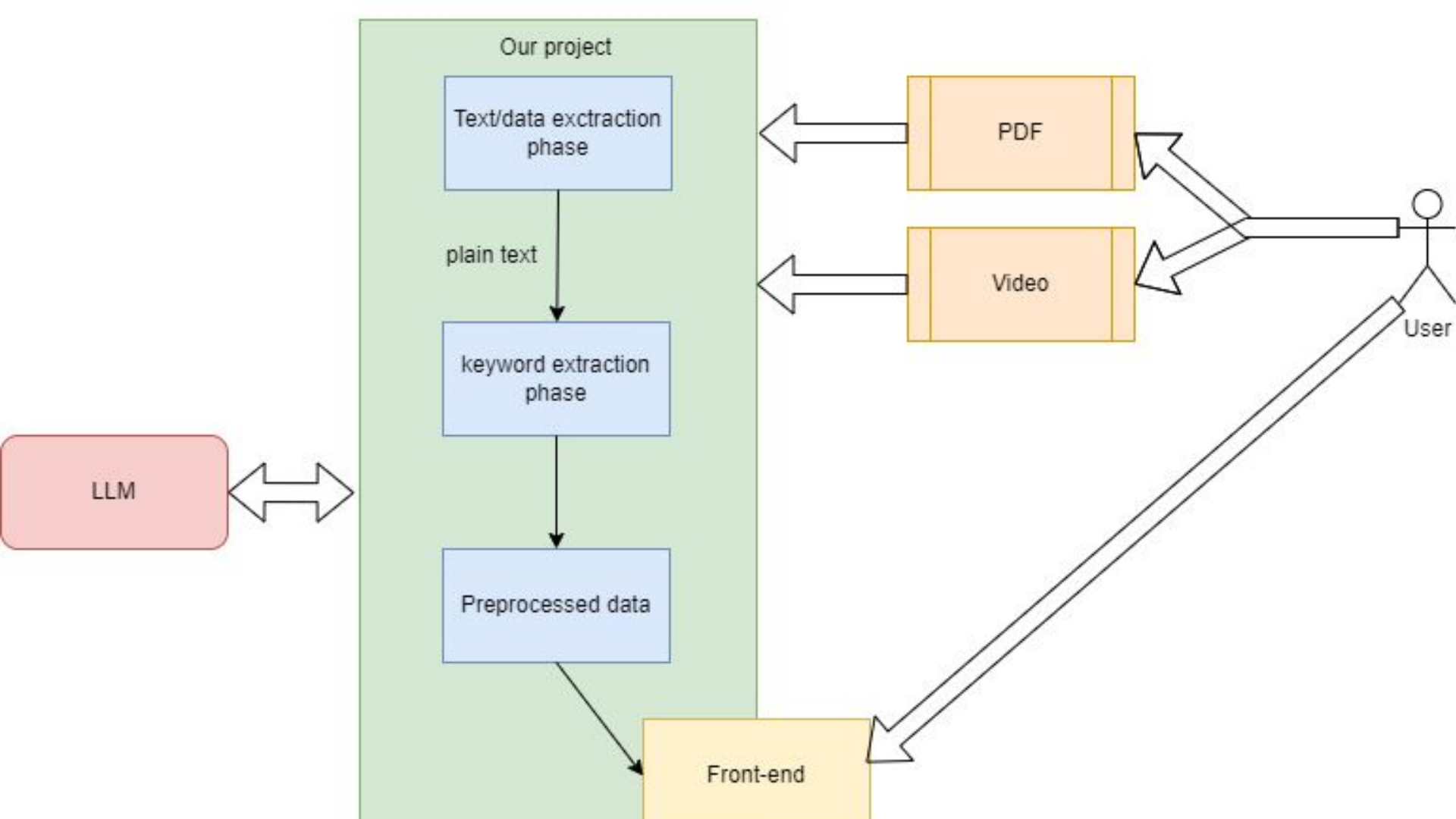
Jan Franěk, Martin Kňazovič - 14.03.2024 PV212

Main idea - motivation

- ultimate goal: speed-up learning process
- different people have different learning styles [1]
 - visual, auditory, kinesthetic
 - alternative definitions
 - interactivity
- automating part of the learning process

Similar tools

- popAI [3]
 - uses OCR (optical character recognition) to extract text from pdf
 - utilizes chatGPT for the user queries
- Harpa AI
 - AI automation agent for browser
 - Youtube summarizer



Technologies - video extraction

- non-trivial task
- requires deep learning
- Whisper by OpenAI
- multi language support
- not only transcription, but even timestamps

Technologies - shared

- Microservices - frontend and backend API
- Backend
 - Python
 - Flask
 - Keybert, rakun2, ChatGPT for keywords
- Frontend
 - Svelte
 - Tailwind CSS
 - Flowbite

Functionality

- built-in chatGPT integration
- automatic keyword highlighting
- text to speech
- watching mode (timestamps)

Reacting to Controversial Opinions of Software Engineers

#object oriented programming, #software engineering, #programming opinions, #developers, #Stack Overflow, #web development, #experience, #ret Von Stack Overflow, #classes, #objects, #inheritance, #abstractions, #design patterns, #single-toned, #factory, #dependency injection, #mutable state, #testing, #refactoring, #JavaScript, #modules, #frameworks, #Angular, #Nest

Object oriented programming is absolutely the worst thing that's ever happened to the field of **software engineering**. In today's video, we'll look at some of the most controversial **programming opinions** coming from highly **experienced developers** on **Stack Overflow**, which is known for its kind, friendly, and not toxic at all community. I'll give you my initial reaction based on my 10 years of **experience**, primarily in **web development**, but in full disclosure, I only have about 5,000 ret Von **Stack Overflow**, so my opinion doesn't really matter very much. If you're new here, like and subscribe, then leave your most controversial opinion, and I'll choose the best one to win a free t-shirt of your choice, and I just release a full bunch of new merch designs, so check those out to support the channel and keep this content coming. All right, so let's get back to that initial opinion that basically says Object oriented programming is horrible. Developers have been hitting on OPA lot in recent years, and even the legendary Edskir Dykestra is quoted saying, Object oriented programs are offered as alternatives to correct ones. The idea behind OOP is been around since the 1960s, and allows **developers** to encapsulate data and logic inside of **objects**.

You start with a class, which is like a blueprint that can then create multiple object instances. These **classes** can inherit behaviors from each other, forming a hierarchy of



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JavaScript

Jump to keyword

Ask GPT

Search on Google

Search on Wiki

Search on Google Scholar



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Chat GPT 11:46

Please ask me anything.

Your message

What is the Javascript?

Verification

- unit tests
 - labeled datasets with expected results
 - text extraction from video/PDF
 - correctly detecting keywords

- how to measure quality of learning?
 - handmade quiz / benchmark
 - compare with other models

Keyword extraction benchmark

- Based on Youtube video
 - Why US elections only give you two choices
 - 20 keywords obtained
 - Will be expanded on if needed
- KeyBERT
 - BERT embeddings and cosine similarity
- Rakun2
 - fast keyword extractor suitable for larger corpora
- ChatGPT 3.5
 - query request for summarization
- Human annotated video

Keyword extraction benchmark - results

- Democracy, vote, election, Republicans, congress, districts
- Results based on cosine similarity
 1. ChatGPT 3.5 (0.894)
 2. KeyBERT (0.891)
 3. Rakun2 (0.736)

Problems

- Video
 - text extraction from voice
 - multi language model
 - non-spoken data (video)
- PDF
 - mathematical formulas
 - pictures with descriptions
 - non-relevant text (footers, logos, repetitions)
 - hierarchy in text

Edge detection by convolution

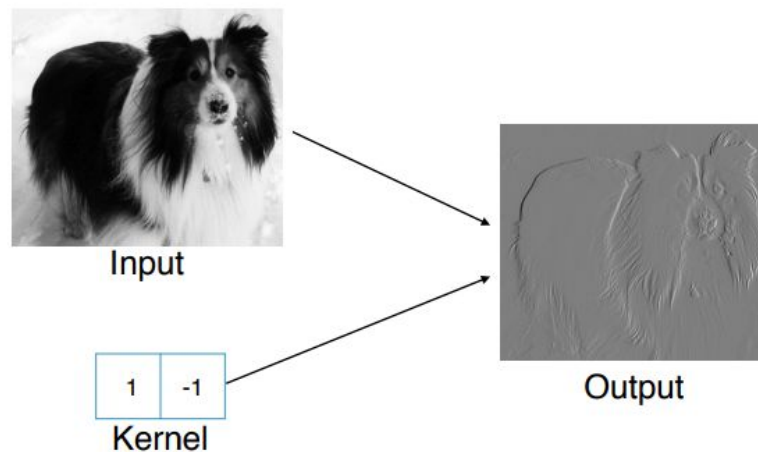


Figure 9.6

(Goodfellow 2016)

Edge detection by convolution

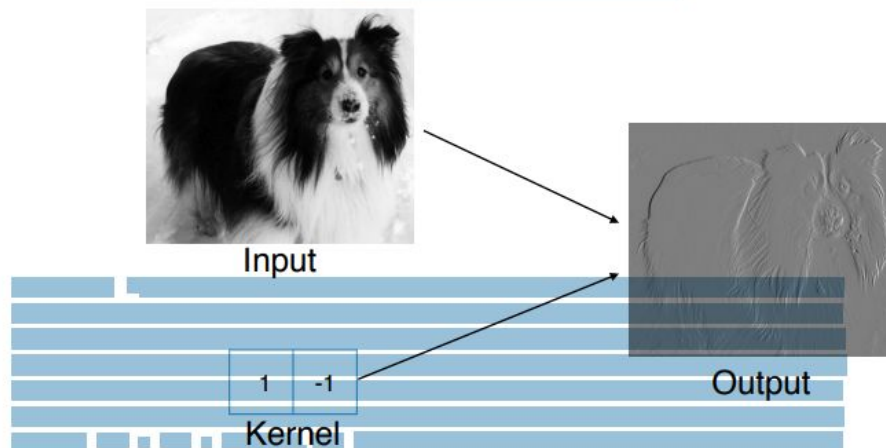


Figure 9.6

(Goodfellow 2016)

Current status

- text extraction
 - pdf
 - video
- keyword detection
- verification
 - benchmarks
 - unit tests
- front-end
 - data presentation
 - LLM integration

Papers to check

- [4] Large Dataset for Keyphrases Extraction
 - may be a useful dataset
- [5] Keyword extraction: Issues and methods. Natural Language Engineering
 - overview of state-of-art approaches
- [6] Intelligent Tutoring Supported Collaborative Learning (ITSCM): A Hybrid Framework
 - personalized results, progress checking
- [7] AI-based video summarization for efficient content retrieval
 - Deep Belief Networks evaluation

Brainstorming

- What integrations would you appreciate?
 - Highlight text -> Google / Papers search
- Browser app or extension?
- Is the evaluation good enough?
- Any other suggestions?

sources

- [1] https://www.educationnext.org/wp-content/uploads/2022/01/ednext_XX_3_furey.pdf
- [2] <https://course.ece.cmu.edu/~ece739/lectures/18739-2020-spring-lecture-07-cnn.pdf>
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- [4] <https://iris.unitn.it/retrieve/e31c0309-5dda-475b-8950-8880878bf1ce/disi09055-krapivin-autayeu-marchese.pdf>
- [5] Firoozeh N, Nazarenko A, Alizon F, Daille B. Keyword extraction: Issues and methods. *Natural Language Engineering*. 2020;26(3):259-291. doi:10.1017/S1351324919000457
- [6] Haq, Ijaz ul et al. "Intelligent Tutoring Supported Collaborative Learning (ITSCLE): A Hybrid Framework." *International Journal of Advanced Computer Science and Applications* 11 (2020): n. pag.

sources

[7]

https://ictactjournals.in/paper/IJIVP_Vol_14_Iss_2_Paper_6_3137_3142.pdf

[8] <https://github.com/HHousen/lecture2notes>