Group 3: Regression

1. Introduction
2. Coding
3. Locally Weighted Regression in detail
4. Live Demo

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Introduction

A Brief Recap

- **Initial Plan:**
  - Focus: Linear Regression
  - Task: Implement five regression models
  - Validation: Compare with established implementations
- **Received Feedback:**
  - Focus on 1 or 2 models
  - Add educational value to the project

Introduction

Our New Approach

- Chose OLS and LWR as focus models
- Retained comparative study
- Developed two web applications
  - One for education
  - One for model visualization

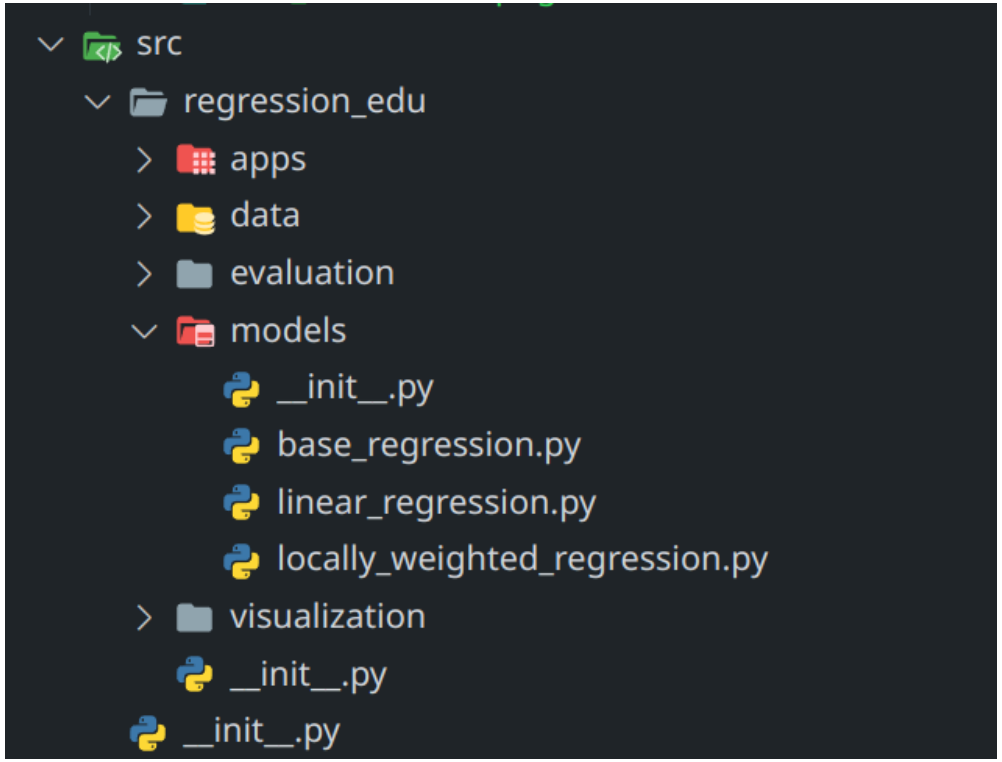
2. Coding

- Dev setup
- SWE principals

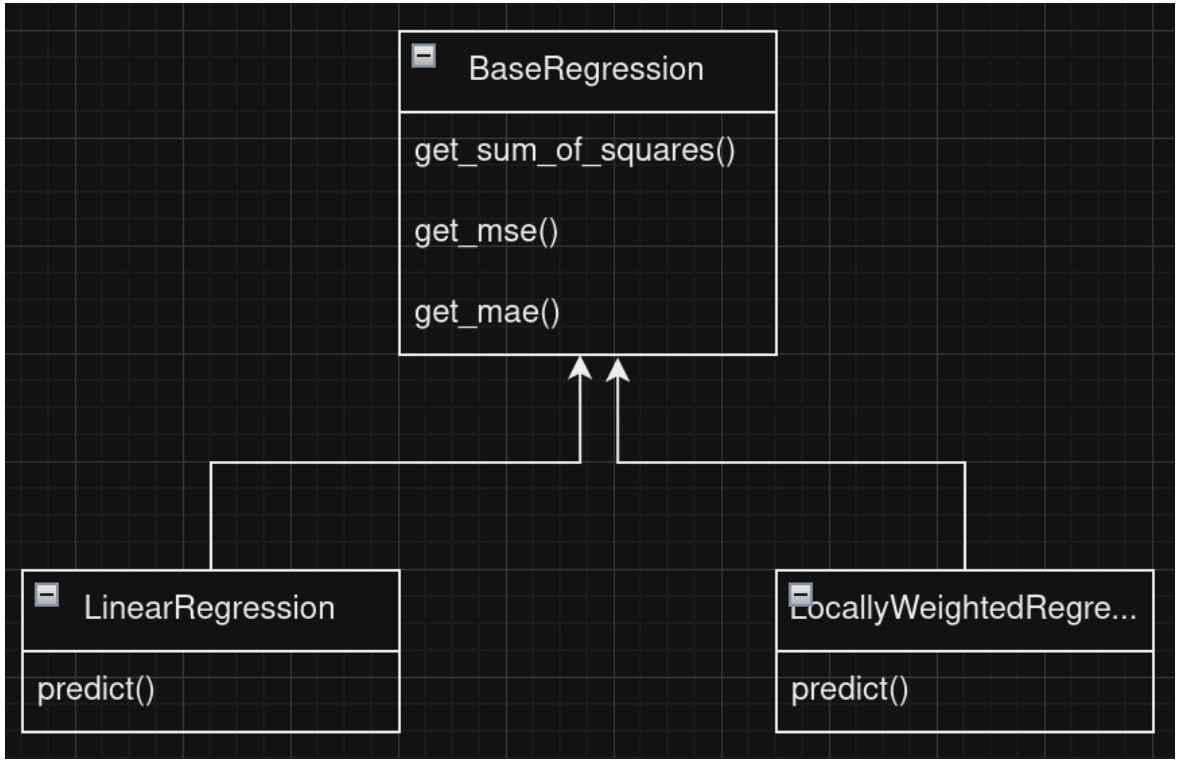
2.1 Coding - Dev setup

- Fixed python version via pyenv (python 3.11)
- Dependencies loaded via pip into a virtual env of the `venv` module of the standard lib
- Code formatting with `black`
- Linting with `pylint`
- Reviews of pushed code
- Usage of github issue tracker

2.2 SWE principals -- Separation of concerns



2.3 SWE principals -- Inheritance



3. Locally Weighted Regression (LWR) in Detail

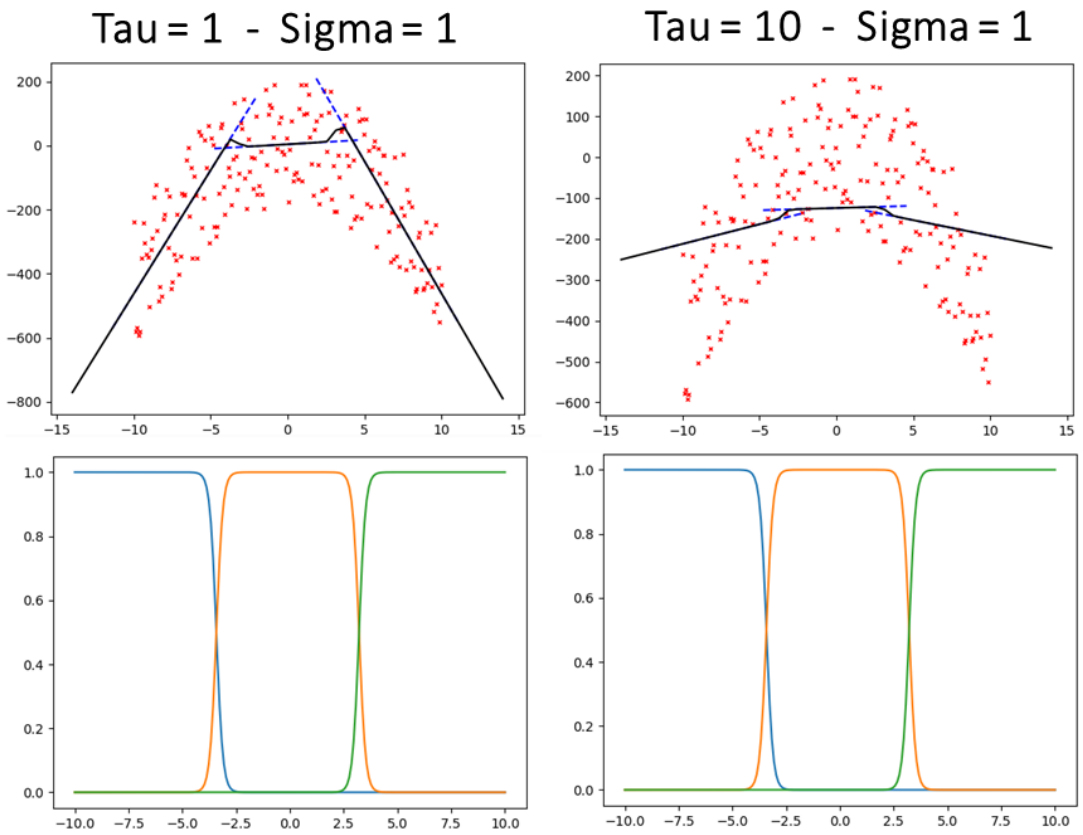
3.1 LWR in Detail

1. Divide intosections
2. For each section, calculate the weighted regression with weight
   $w_i(x) = e^{-\frac{(centre_i - x)^2}{2\tau^2}}$
3. Smoothen the function with $gauss_{centre}(x) = e^{-\frac{(centre - x)^2}{2\sigma^2}}$ and normalising it by dividing through $\Sigma_{centre}\ gauss_{centre}(x)$
   $f(x) = \frac{1}{\Sigma_i\ gauss_i(x)} \Sigma_i gauss_i(x) \cdot f_i(x)$

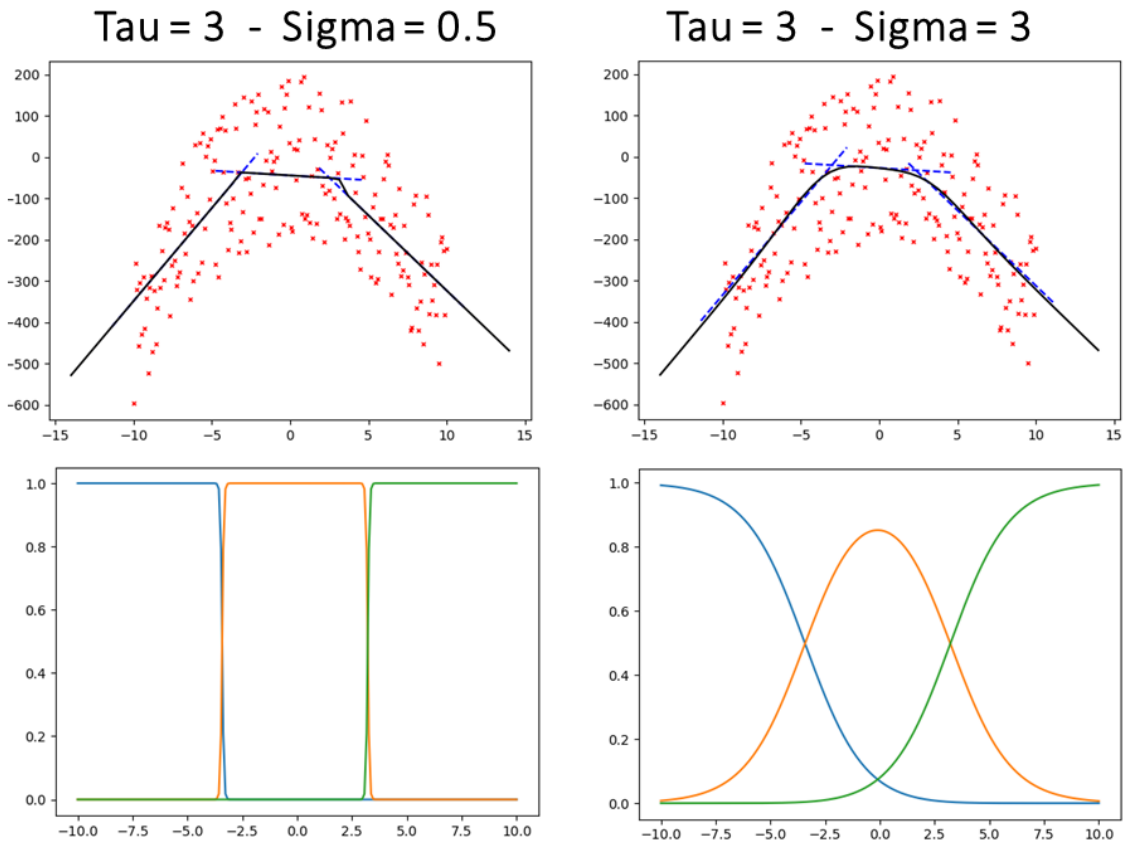
Hyperparameters:

- *amount sections*
- *tau*
- *sigma*

3. LWR in Detail - Influence of Tau



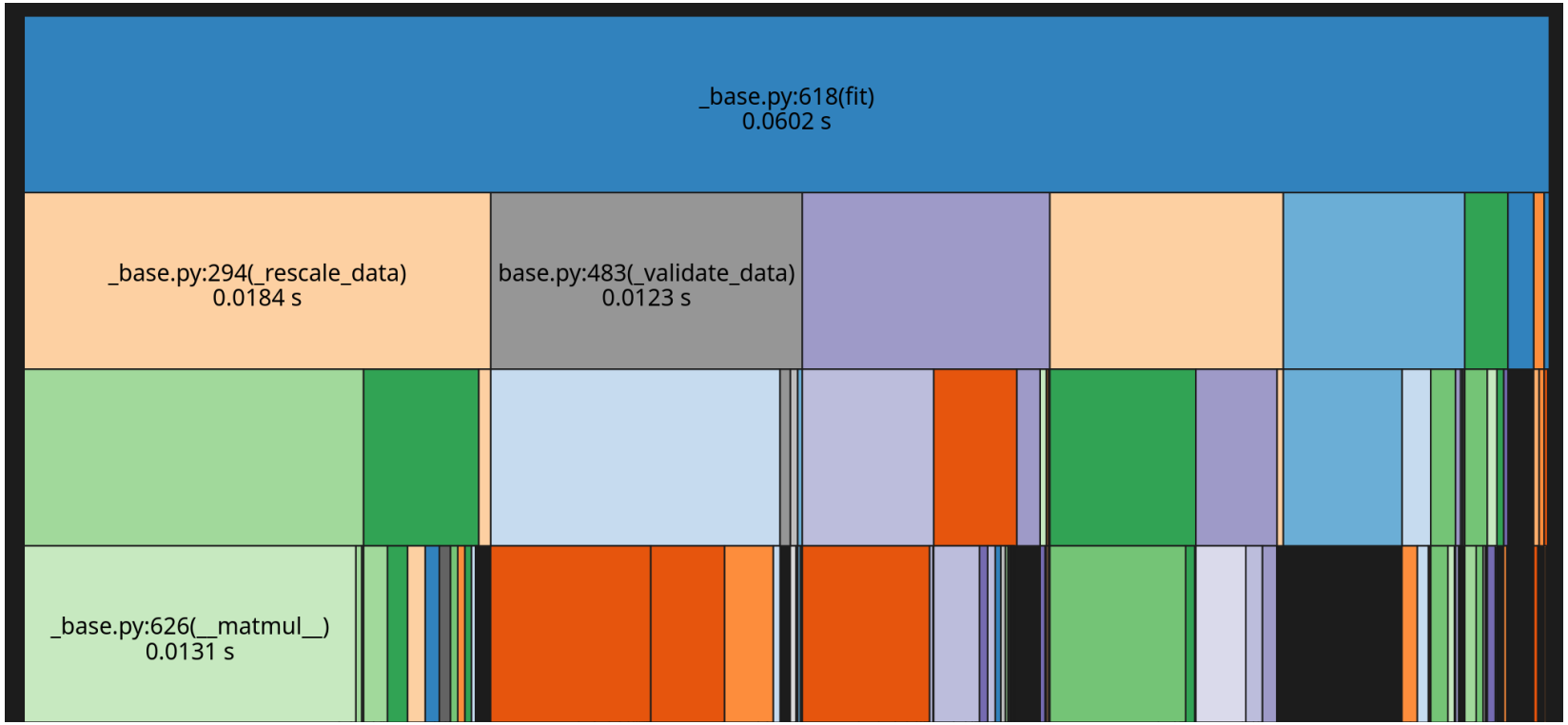
3. LWR in Detail - Influence of Sigma



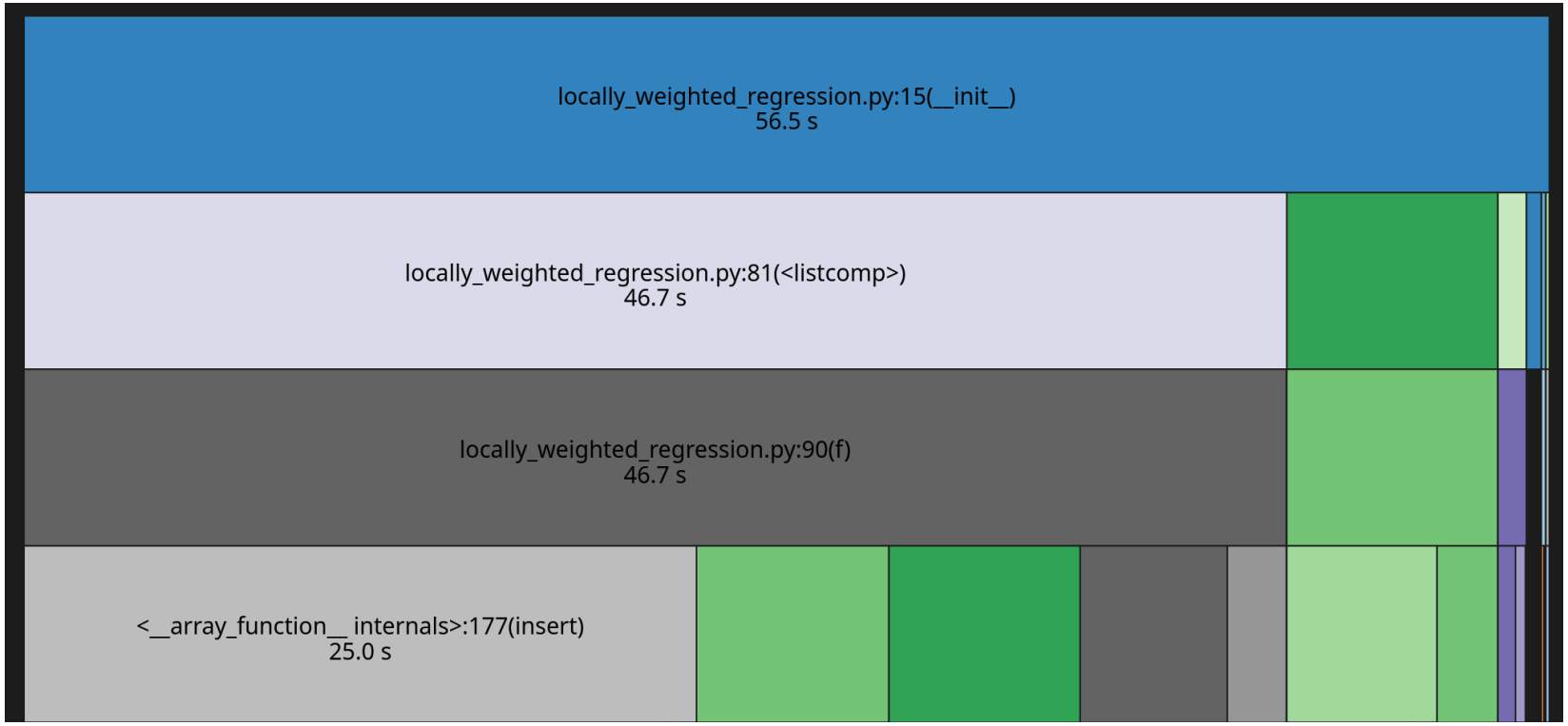
4. Runtime Performance

4.1 Linear Regression (ours)

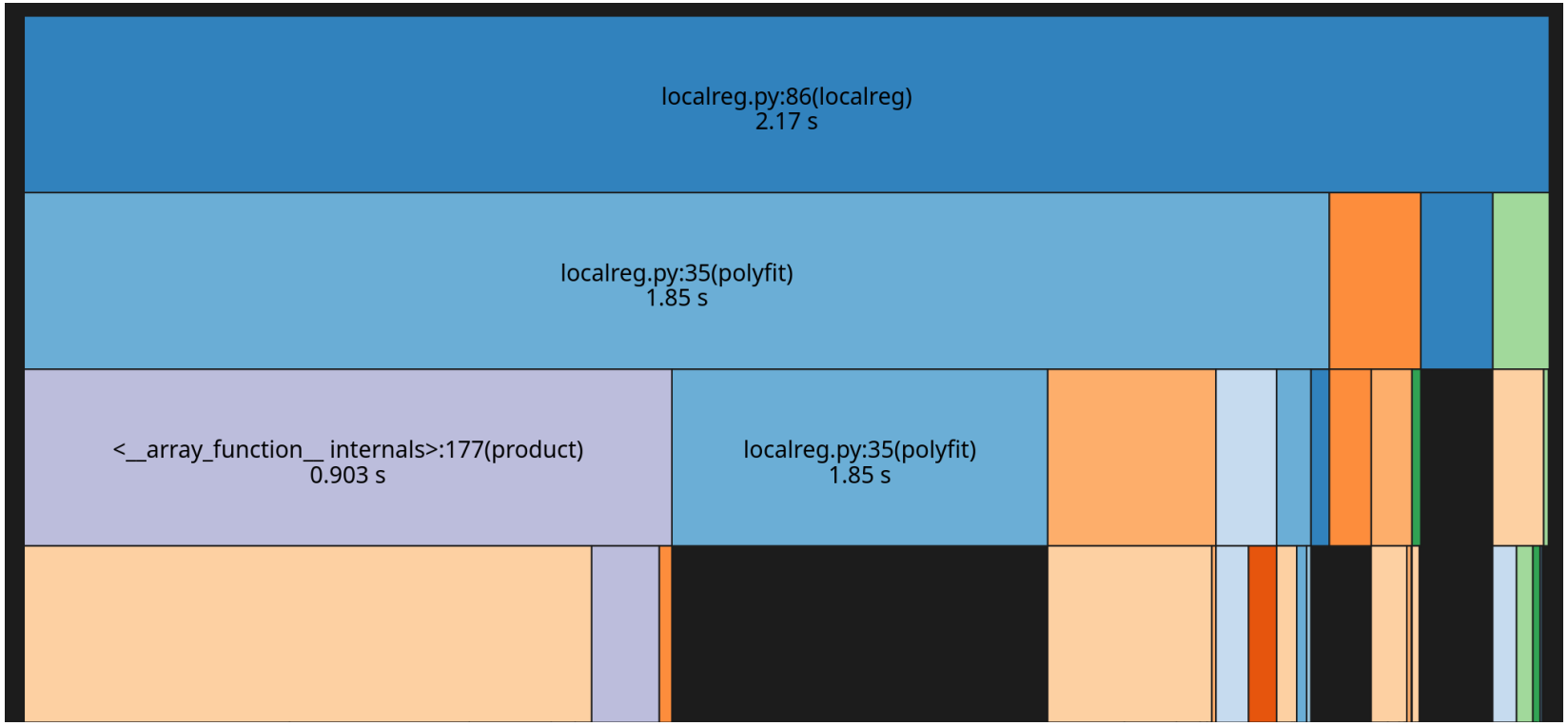
4.2 Linear Regression (from sklearns)



4.3 Linear Regression (ours)



4.4 Linear Regression (from localreg)



4. Live Demo