Group 3: Regression

1. Introduction

2. Coding

3. Locally Weighted Regression in Detail

4. Runtime Performance

5. 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
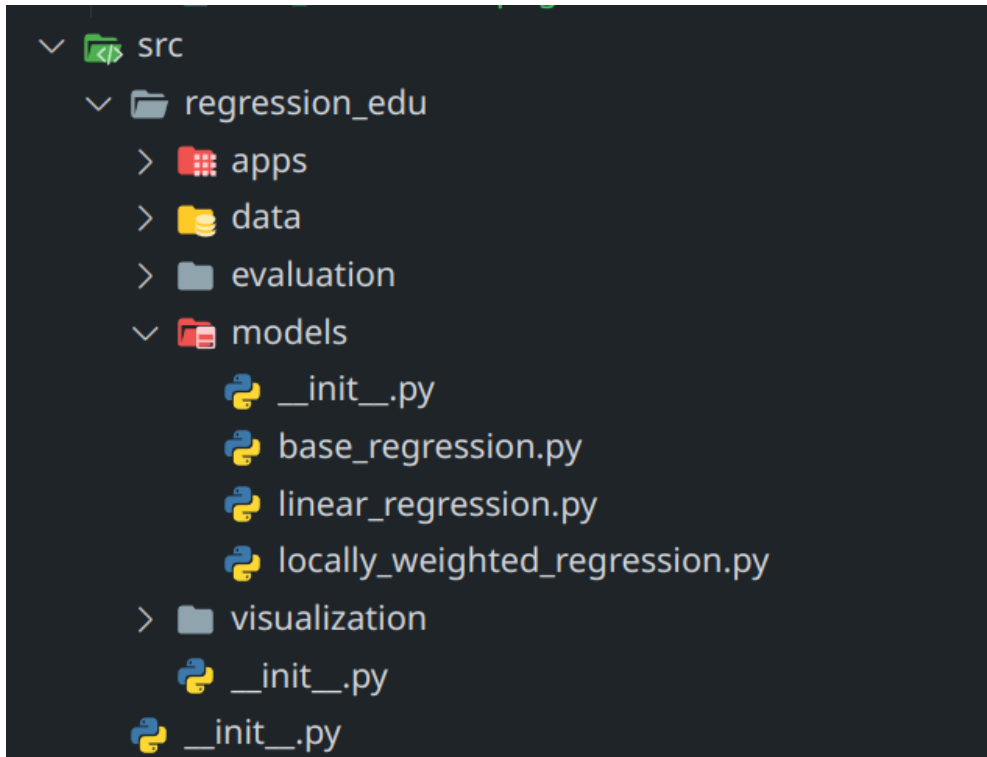 - One for education
  - One for model visualization

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2. Coding

- Dev setup
- SWE principals

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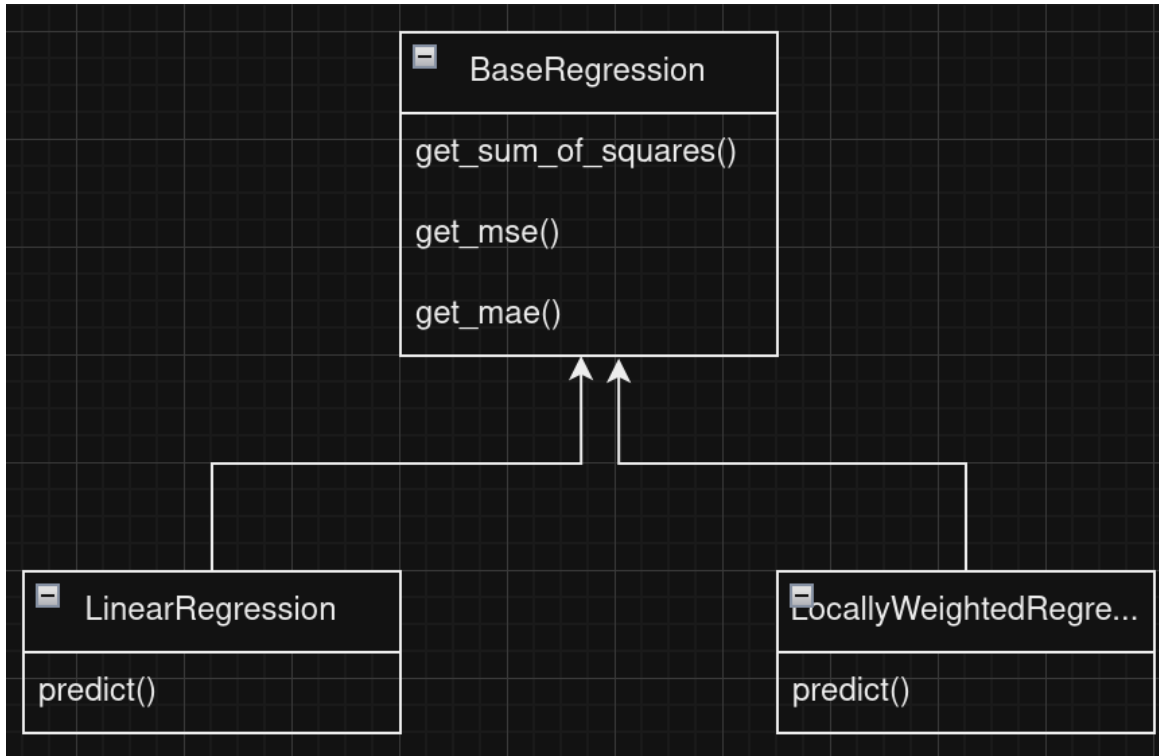
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2.1 Coding - Dev setup

- 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

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2.3 SWE principals -- Inheritance

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3. Locally Weighted Regression (LWR) in Detail

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3.1 LWR in Detail

1. Divide intersections

2. For each section, calculate the weighted regression with weight

$$w_i(x) = e^{-\frac{(centre_i - x)^2}{2\tau^2}}$$

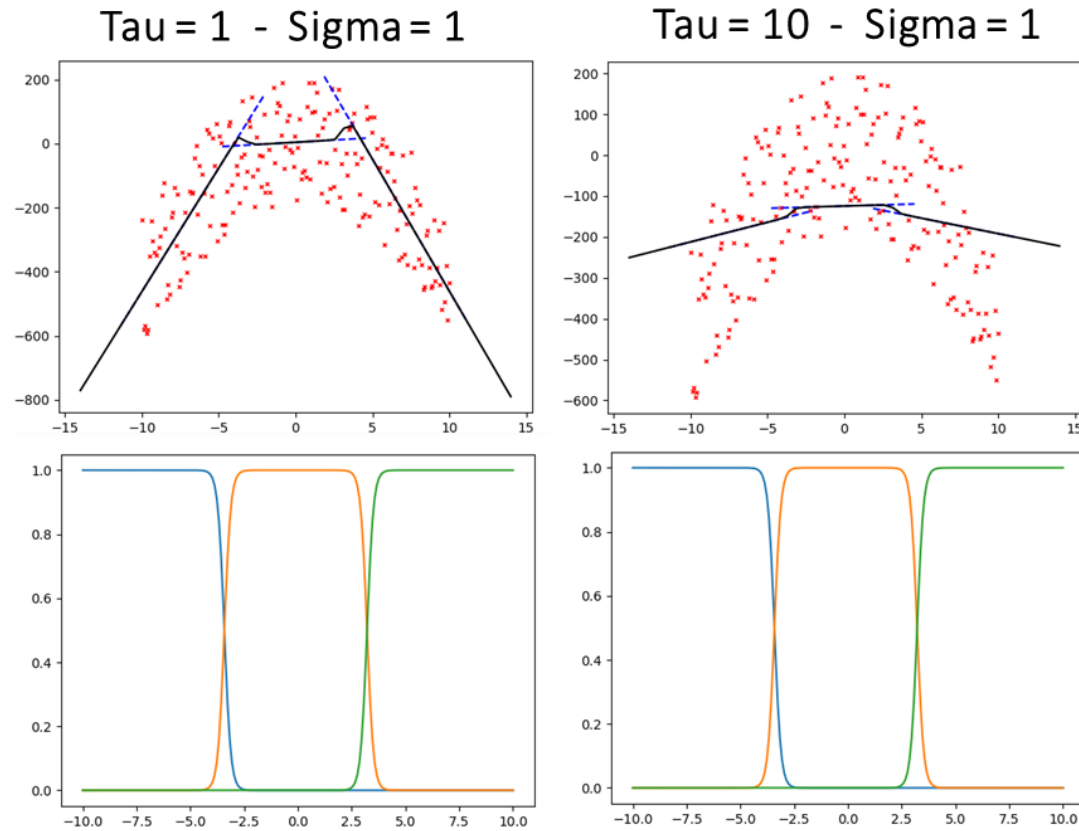3. Smoothen the function with $gauss_{centre}(x) = e^{-\frac{(centre - x)^2}{2\sigma^2}}$ and normalising it by dividing through $\Sigma_{centre}\, gauss_{centre}(x)$

$$f(x) = \frac{1}{\Sigma_i\, gauss_i(x)} \Sigma_i gauss_i(x) \cdot f_i(x)$$

Hyperparameters:

- *amount sections*

- *tau*

- *sigma*

3. LWR in Detail - Influence of Tau

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3. LWR in Detail - Influence of Sigma

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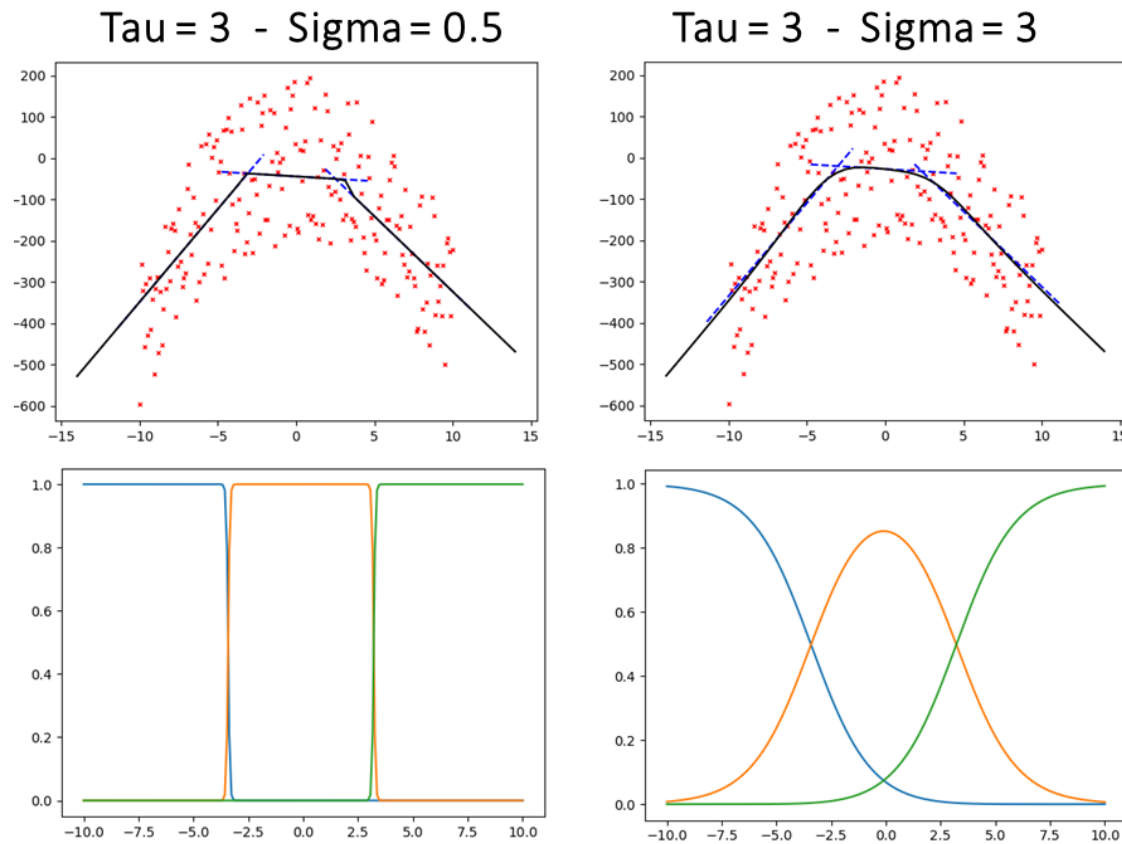
4. Runtime Performance - Setup

Time Complexity:

- 50 iterations
- 50 data points
- 2 independent variables

Memory Consumption:

- 1 iteration
- 500 samples
- one independent variable

4. Runtime Performance - Results

	Time Complexity	Memory Consumption
Linear Regression	0.138s	0MiB
skearn.linear_model	0.060s	0MiB
Locally WeightedRegression	56.500s	45.3MiB
localreg	2.170s	0MiB

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5. Live Demo

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