

# Neural and Evolutionary Learning

## Class 1 - Rules and foundations

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2025

# Purpose of Practical Classes

*"Theory without practice is empty; practice without theory is blind."*

Kant

- **Programming skills:** you definitely need to code well to be a good data scientist;
- Implement or use implemented methods studied in theoretical classes: **coding is debugging ideas**;
- **Teamwork:** we are not competing, we are cooperating: help and ask for help as soon as possible.

# Feedback and Assistance

[krebuli@novaims.unl.pt](mailto:krebuli@novaims.unl.pt)

(Consider that I may not be available at the exact time you will ask me for help, so ask for help it as soon as possible.)

Two-way feedback:



<https://forms.gle/EV9VkExNtfNckMSM8>

# Agenda

Practical classes:

- ▶ Wednesdays: 10h to 11h30 (Practical Group 1)
- ▶ Thursdays: 11h to 12h30 (Practical Group 2)

2025 APRIL						
SUN	MON	TUE	WED	THU	FRI	SAT
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

2025 MAY						
SUN	MON	TUE	WED	THU	FRI	SAT
				1	2	3 PG1 PG2
4	5	6	7 PG1	8 PG2	9	10
11	12	13	14 PG1	15 PG2	16	17
18	19	20	21 PG1	22 PG2	23	24
25	26	27	28 PG1	29 PG2	30	31

2025 JUNE						
SUN	MON	TUE	WED	THU	FRI	SAT
1	2	3	4 PG1	5 PG2	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

➔ The April 23<sup>rd</sup> and 24<sup>th</sup> classes will be held on May 3<sup>rd</sup>, Room 5:

- P2 at 14h30
- P1 at 16h

➔ The April 30<sup>th</sup> and May 1<sup>st</sup> classes will be rescheduled to a date yet to be determined.

<https://www.free-printable-calendar.com/>

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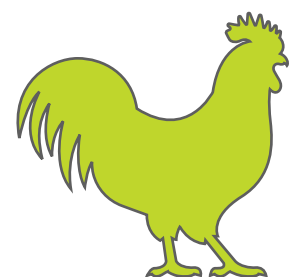
➔ Second compensation practical class: Probably on May 10th.

<https://www.free-printable-calendar.com/>

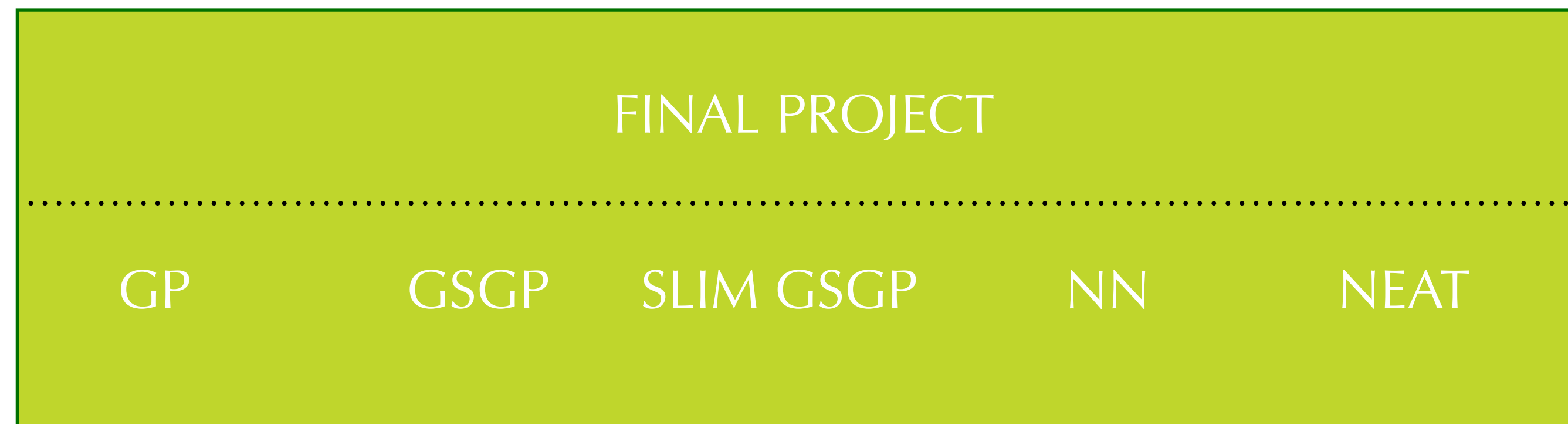


# Final Project

The primary objective of this project is to compare and discuss the behavior, performance, and application of the models studied in the NEL course.

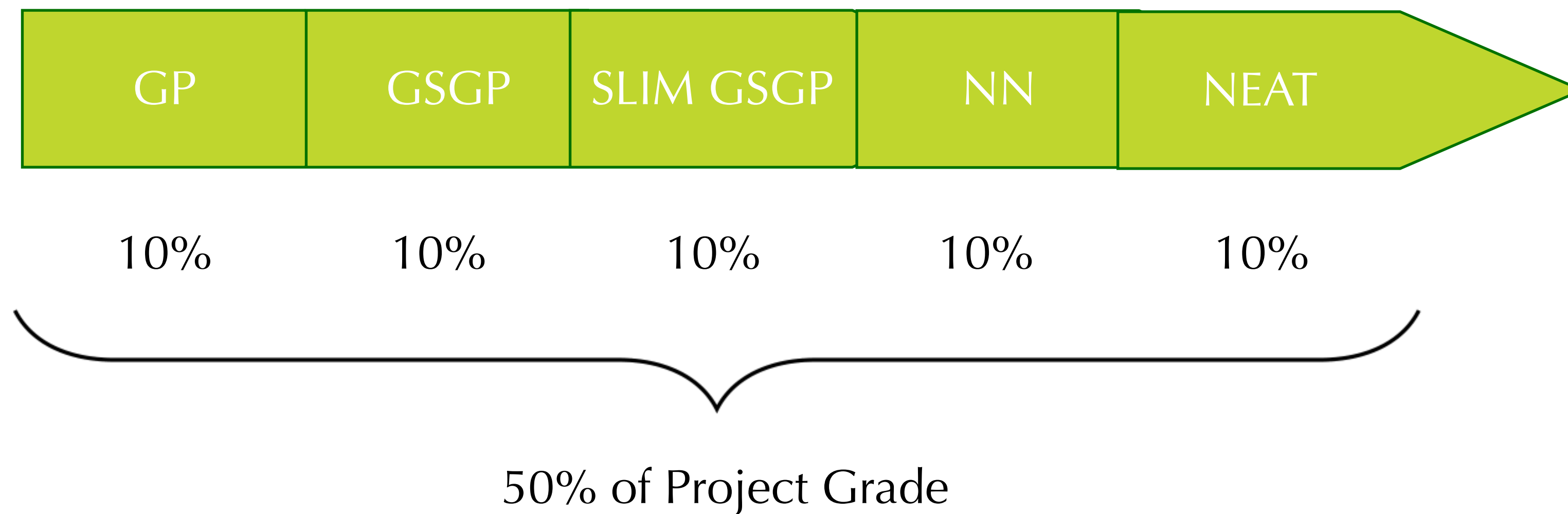


The models will be used to predict the chicken crude protein weight using the remaining features in the dataset (excluding the animal ID).



**Start exploring the data as soon as possible.**

# Final Project



# Final Project



- 50% of Project Grade: weekly deliverables;
- 15% of Project Grade: final report combining and discussing the results.
- 35% of Project Grade: oral presentation and discussion.
- Extra 1 point to an optional exercise to be announced.



# Final Project

- Evaluation criteria

Category	Subcategory	Points	Total
Weekly deliverables	Code organization	0.25 x 5 = 1.25	10
	Code efficiency	1.5 x 5 = 7.5	
	Presentation of the results	0.25 x 5 = 1.25	
Final deliverable	Code organization	0.25	3
	Code efficiency	0.25	
	Writing (maximum 4 pages, including references)	0.5	
	Plots	0.5	
	Statistical methods	0.5	
	Discussion of results	1	
	Optional exercise *	+1	
	Extra page **	-1	
Oral presentation	Working group distribution	1	7
	Code implementation discussion	2	
	Algorithms implementation discussion	2	
	Individual algorithms comparison discussion	2	
Final grade			20

Obs: \* Optional exercise that gives 1 extra point to the students.

\*\* Maximum of 2 extra pages. Reports longer than 6 pages will not be accepted.

# Resources

Python should be used for coding the algorithms and experiments for the final project.

Algorithm	Framework
GP	<code>slim_gsgp</code> <sup>1</sup>
GSGP	<code>slim_gsgp</code>
SLIM_GSGP	<code>slim_gsgp</code>
NN	pyTorch <sup>2</sup> or tensorflow <sup>3</sup>
NEAT	NEAT-Python <sup>4</sup>

1: Rosenfeld et al. 2025 Slim\_gsgp: A Python Library for Non-Bloating GSGP. <https://github.com/DALabNOVA/slim>

2: Paszke et al. 2019 PyTorch: An Imperative Style, High-Performance Deep Learning Library. <https://pytorch.org/>

3: Abadi et al. TensorFlow: Large-scale machine learning on heterogeneous systems, 2015. Software available from <https://www.tensorflow.org>.

4: McIntyre, A., Kallada, M., Miguel, C. G., Feher de Silva, C., & Netto, M. L. <https://github.com/CodeReclaimers/neat-python>

*For writing the final report, plots or other resources, you can use any resource you want.*

# Deadlines

## Weekly deliverables:

- One week from the date in which the task has been proposed 😊

## Final report:

- 23h59 on June 8th, 2025.

Late submissions **will not be accepted.**

# Python Enviroment

- It is highly recommended to work in an environment dedicated to the course.
- The recommended libraries are included in the `ne1_2025_env_full.yml` file, available in the respective folder of this class.

Questions?



<https://forms.gle/EV9VkExNtfNckMSM8>

Register your feedback