Presentation

Medical Imaging

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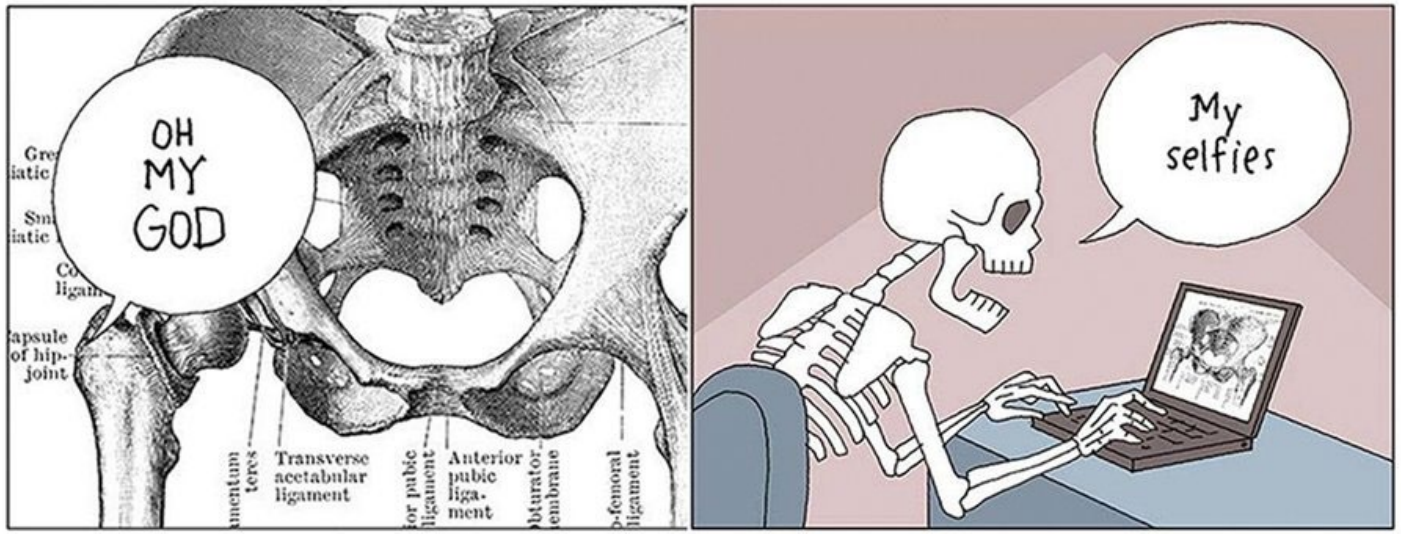
29/09/2025

Medical Imaging could be fun



Objectives of the module

- Provide the foundations of the most commonly used medical imaging techniques.
- Learn basic processing methods and tools used to improve image quality.
- Basis for more advanced image processing techniques (Q2, Q3).
- Learn the basics of Jupyter Notebook and Google Colab environments.

Faculty

- Oliver Díaz (oliver.diaz@ub.edu) – Block 1
- Roser Sala (roser.sala@ub.edu) – Block 2
- Simone Balocco (simone.balocco@ub.edu) – Block 3

Students

Syllabus Theory (Mon)

- **Block 1 (Oliver)**
  - Principles of medical imaging
  - X-ray imaging (2D and 3D)
- **Block 2 (Roser)**
  - Magnetic resonance imaging
  - Nuclear imaging
- **Block 3 (Simone)**
  - Ultrasound imaging
  - Intravascular imaging
  - Histological imaging
  - Other medical imaging technologies

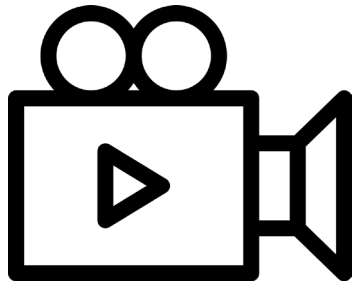
Labs (Wed)

- **P0**. Introduction to Jupiter Notebooks. Image manipulation.
- **P1**. CT image visualisation and reconstruction + noise/denoise.
- **P2**. Automated segmentation.
- **P3**. Functional brain connectivity.
- **P4**. Ultrasound denoise

Methodology

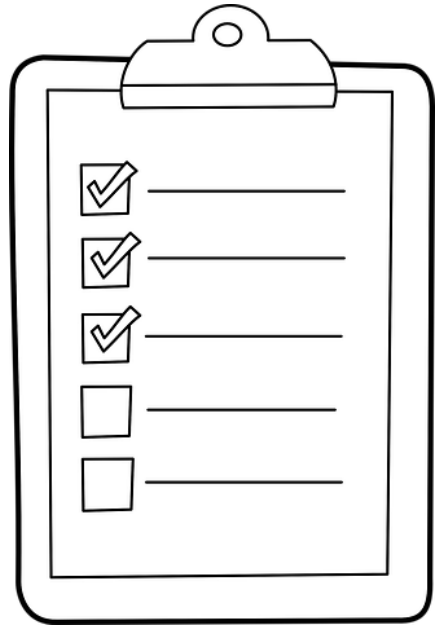
- **Theory**
  - Mondays (1.5 hrs) from 14:00-15:30 (CET)
  - Online via TEAMS
  - Synchronous (online) sessions with members of the faculty
  - Cover the material via PPT presentations
- **Labs**
  - Wednesdays (1 hr) from 14:00-15:00 (CET)
  - Online via TEAMS
  - Synchronous (online) sessions with members of the faculty
  - Description of the lab session and support

All sessions will be registered.



Evaluation

- **Theory (T)**
  - Multiple-choice tests at the end of each block (x3)
  - Same weight for each tests
- **Labs/Practica (P)**
  - Delivery of each practicum (x4)
  - Same weight for each practicum
- **Oral Presentation (OP)**
  - Presentation of scientific publication (x1)



Final Mark = 0.3 T + 0.5 P + 0.2 OP

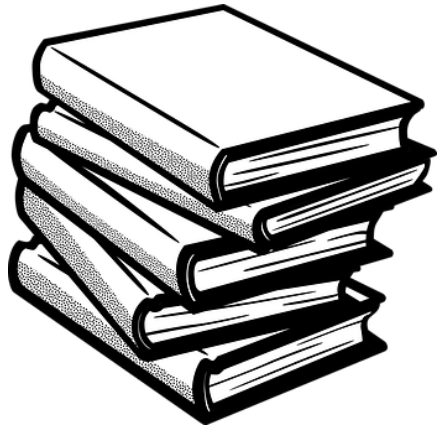
A student is considered passed if his final grade is greater than or equal to 5.0. Otherwise, the student will have to do additional activities defined by the professors of the module with a penalty on the final grade.

Planning

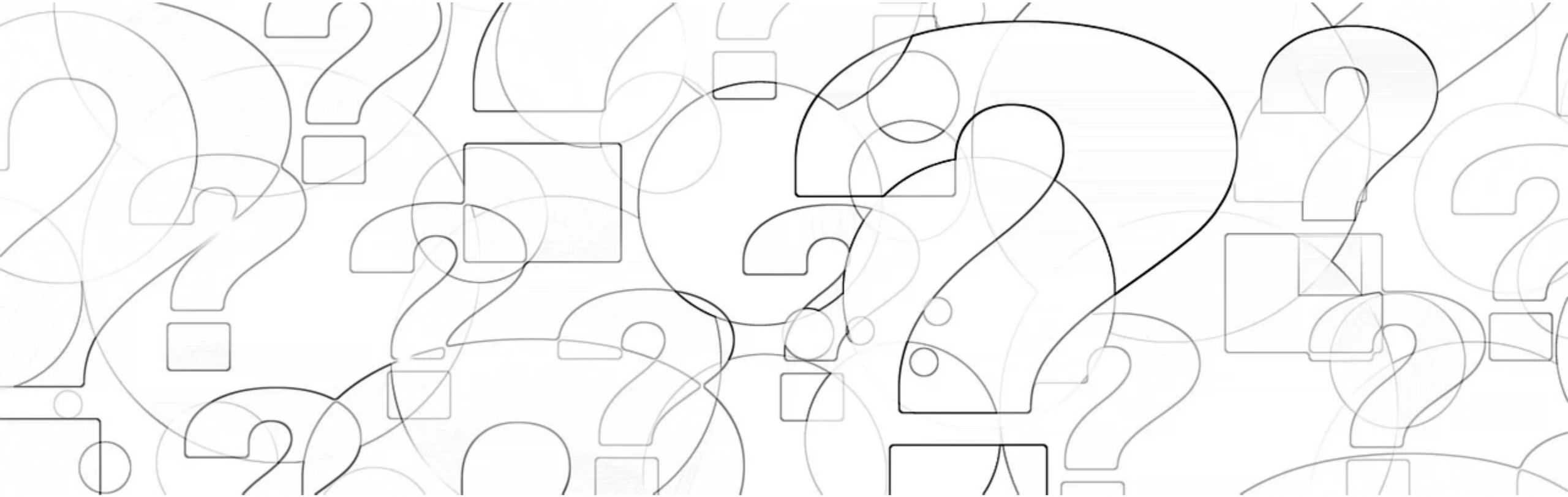
Week			Mon	Tues	Wed	Thur	Fri	Theory (Mon)	Lab (Wed)
1	Block 1	29 Sep - 5 Oct (Week 1)	**T0**. Presentation		**P0**. Introduction to Jupiter Notebook + Pandas			Oliver	Simone
2		6 Oct - 12 Oct (Week 2)	**T1**. Principles of medical imaging		**P0.** Image manipulation			Oliver	Simone
3		13 Oct - 19 Oct (Week 3)	**T2**. 2D x-ray imaging		**P1**. CT Image reconstruction +			Oliver	Oliver
4		20 Oct - 26 Oct (Week 4)	**T3**. 3D x-ray imaging		**P1**			Oliver	Oliver
5		27 Oct - 2 Nov (Week 5)	**T4**. Intro oral presentations + TEST 1		**P1**			Oliver	Oliver
6	Block 2	3 Nov - 9 Nov (Week 6)	**T5**. MRI: Basis and acquisition	Submission P1	**P2**. Automated segmentation			Roser	Roser
7		10 Nov - 16 Nov (Week 7)	**T6**.Processing of diffusion MRI		**P2**			Roser	Roser
8		17 Nov - 23 Nov (Week 8)	**T7**.Functional MRI	Submission P2	**P3.** Functional brain connectivity			Roser	Roser
9		24 Nov - 30 Nov (Week 9)	**T8**. Nuclear imaging: PET & SPECT		**P3**			Roser	Roser
10		1 Dec - 7 Dec (Weel 10)	**T9**. Nuclear Imaging: PET & SPECT		TEST 2 + **P3**			Roser	Roser
11	Block 3	8 Dec - 14 Dec (Week 11)	Bank Holiday	Submission P3	**P4**. Image processing in ultrasound				Simone
12		15 Dec - 21 Dec (Week 12)	**T10**. Ultrasound images, Doppler		**P4**			Simone	Simone
		22 Dec - 28 Dec	Merry					-	-
		29 Dec - 4 Jan	Christmas					-	-
13		5 Jan - 11 Jan (Week 13)		Bank Holiday	Students' oral presentations			-	Simone/Oliver
14		12 Jan - 18 Jan (Week 14)	Students' oral presentations		Students' oral presentations			Simone	Simone/Oliver
15		19 Jan - 25 Jan (Week 15)	**T11**. Other medical imaging technologies + TEST 3		**P4**	Submission P4		Simone	Simone

Bibliography

- González, Rafael C., Richard E. Woods, and Richard E., Digital Image Processing, 4th Edition, Pearson
- Bankman, I. N., Handbook of Medical Imaging Processing and Analysis, , Academic Press line
- Other material (books/scientific publications) provided in the slides
  - Digital Library of the URV
  - Google Scholar
  - Unpaywall



Any question?



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