Advanced techniques and methodologies for brain circuit-level analysis

PROGRAM

Module 1. Brain anatomy: from cells to circuits

Day 1 22/04/2024	Morning	9h30-10h	**Welcome reception**	Carina Cunha	G2.02
		10h	**Lecture** "From brain cells to circuits to behavior"	Ana João Rodrigues	G2.02
		11h30-12h30	**Seminar** "Tracers and viral approaches to find and define cell-cell connections in the brain"	Hugo Almeida/Carina Cunha	G2.02
			Lunch break		
	Afternoon	13h30-16h	**Team-based learning (TBL) 1** How to design a tracing experiment to evaluate the connectivity between two brain regions	Ana João Rodrigues/Carina Cunha	G2.02
		16h30	**Presentation of TBL 1**	Ana João Rodrigues/Carina Cunha	G2.02
		17h30-18h30	**SELF STUDY**		
Day 2 23/04/2024	Morning	9h-9h45	**Seminar** "How to perform intracranial injection for circuit analysis"	Carina Cunha/Ana João Rodrigues	G2.02
		10h15-13h15	**Practical session 1 - Group I** Intracranial viral vector injection - stereotaxic surgery	Bárbara Coimbra, Joana Silva, Verónica Domingues, Inês Ribeiro	I2.04
			TBL 2 - Group II Define stereotaxic coordinates for a specific brain region	Ana João Rodrigues/Carina Cunha	G2.02
			Lunch break		
	Afternoon	14h30-17h30	**Practical session 1 - Group II** Intracranial viral vector injection - stereotaxic surgery	Bárbara Coimbra, Joana Silva, Verónica Domingues, Inês Ribeiro	I2.04
			TBL 2 - Group I Define stereotaxic coordinates for a specific brain region	Ana João Rodrigues/Carina Cunha	G2.02
		17h30-18h30	**SELF STUDY**		
Day 3 24/04/2023	Morning	9h	**Lecture** "Glia-neuron interactions and cytogenesis"	Dinis Alves/Carina Cunha	G2.02
		10h30	**Seminar** "How to cut brains for histological analysis"	Verónica Domingues/ Ana João Rodrigues/ Bárbara Coimbra, Verónica Domingues, Inês Ribeiro, Carina Cunha, Ana João Rodrigues	G2.02
		11h-13h	**Practical session 2 - Group II** Cut brains in vibratome and cryostat and cryopreserve samples		I2.04 / I2.γ04
			Lunch break		
	Afternoon	14h-16h	**Practical session 2 - Group I** Cut brains in vibratome and cryostat and cryopreserve samples	Bárbara Coimbra, Verónica Domingues, Inês Ribeiro, Carina Cunha, Ana João Rodrigues	I2.04 / I2.γ04
		16h-17h	**Presentation of TBL 2**	Ana João Rodrigues/Carina Cunha	G2.02
		17h-18h30	**SELF STUDY**		
Day 4 26/04/2024	Morning	9h	**Lecture** "The cellular and molecular substrates and shared mechanisms of comorbid addiction and depression"	Jacques Barik/ Ana João Rodrigues	G2.02
		10h30	**Seminar** "Methods to label and identify cells and circuits in the brain"	Luísa Pinto/Carina Cunha	G2.02
		11h30-13h00	**Practical session 3 - Group I, Group II** Immunofluorescence and RNAscope	Bárbara Coimbra, Carina Cunha	I2.04
			Lunch break		
	Afternoon	14h00-15h00	**Seminar** "How to take the most of public databases of gene expression and tracing"	Ana João Rodrigues/Carina Cunha	I2.08
		15h00-18h30	**Practical session 4 - Group I, Group II** Semi-automatic and automatic techniques for fluorescence labeling analysis	Bárbara Coimbra, Marcelina Wezik, Carina Cunha, Ana João Rodrigues	I2.04

Module 2. Neuronal activity and neurotransmitters

Day 5 29/04/2024	Morning	9h00	**Seminar** "Introduction to fiber photometry and 1-photon miniaturized microscopes principles"	Carina Cunha/ Ana João Rodrigues	G2.02
		10h30-13h	**Practical session 5 - Group I** Implantation of a fiber	Nuno Dinis Alves, Bárbara Coimbra	I2.04
		10h30-13h	**TBL 3 - Group II** Design an imaging/photometry experiment	Ana João Rodrigues/ Carina Cunha	G2.02
			Lunch break		
	Afternoon	14h-15h	Lecture "Novel calcium/voltage indicators and neurotransmitter sensors for the study of neurons"	Lin Tian / Carina Cunha	G2.02
		15h30-18h	**Practical session 5 - Group II** Implantation of a fiber	Nuno Dinis Alves, Bárbara Coimbra	I2.04
		15h30-18h	**TBL 3 - Group I** Design an imaging/photometry experiment	Ana João Rodrigues/ Carina Cunha	G2.02
Day 6 30/04/2024	Morning	9h-12h	**Practical session 5 - Group II** GRIN Lens implant **SELF STUDY - Group I**	Carina Cunha, Verónica Domingues/ Ana João Rodrigues	I2.04
			Lunch break		
	Afternoon	13h-16h	**Practical session 5 - Group I** GRIN Lens implant **SELF STUDY - Group II**	Carina Cunha, Verónica Domingues/ Ana João Rodrigues	I2.04
		16h-17h	**Presentation of TBL 3**	Ana João Rodrigues/ Carina Cunha	G2.02
		17h-18h30	**SELF STUDY**		
Day 7 02/05/2024	Morning	9h-10h	**Seminar** "Chemo and optogenetics to manipulate neuronal circuits"	Bárbara Coimbra/ Carina Cunha	G2.02
		10h-10h45	**Lecture** ""Genetic and optogenetic circuit dissection in neuropsychiatric disorders"	João Peça/ Ana João Rodrigues	G2.02
		11h-13h	**Practical session 6 - Group I, Group II** Fiber photometry data collection	Carina Cunha, Nuno Dinis Alves, Verónica Domingues, Ana João Rodrigues	I2.04
			Lunch break		
	Afternoon	14h-18h	**Practical session 6 - Group I, Group II** Calcium imaging data collection	Carina Cunha, Verónica Domingues, Ana João Rodrigues	I2.04
Day 8 03/05/2023	Morning	9h-10h	**Seminar** "Pain and pleasure collide in the brain"	Hugo Almeida	G2.02
		10h15-11h	**Seminar** "Large scale electrophysiology: the good, the bad and the ugly"	Bárbara Coimbra/Ana João Rodrigues	G2.02
		11h-13h	**Practical session 7 - Group I, Group II** Implantation of probes for acute recordings with silicone probes	Bárbara Coimbra, Leandro Aguiar	I2.04
			Lunch break		
	Afternoon	14h-15h	**Lecture TBA**	Luke Sjulson	Zoom
		15h-18h	**Practical session 7 - Group I, Group II** Implantation of probes for acute recordings with silicone probes (cont)	Bárbara Coimbra, Leandro Aguiar, Carina Cunha/Ana João Rodrigues	I2.04
Day 9 06/05/2024	All day	9h-10h	**Lecture** "The brain is more than neurons: how astrocytes contribute for mood and cognition"	João Oliveira/Carina Cunha	A2.09
		10h-10h30	**Latest neuroscience findings** - publication reading and definition of major outcomes (by ZOOM)	Carina Cunha/Ana João Rodrigues	A2.09
		15h-16h30	Presentation of publication's major outcomes (by ZOOM)		
		16h30-18h30	**SELF STUDY**	Carina Cunha/Ana João Rodrigues	

Module 3. Data analysis

Day 10 07/05/2023	Morning	9h-9h45	**Lecture** "Diversity of nucleus accumbens neurons in appetitive and aversive behaviors"	Carina Cunha/Ana João Rodrigues	A1.12
		10h-11h	**Seminar** "Using machine learning to get most of the imaging data"	Tawan Carvalho/Carina Cunha	A1.12
		11h-13h30	**Practical session 8 - Group I, Group II** Analysis of fiber photometry and calcium imaging data using open-source tools and codes	Tawan Carvalho, Verónica Domingues Carina Cunha/Ana João Rodrigues	A1.12
			Lunch break		
	Afternoon	14h30-19h	**Practical session 8 - Group I, Group II** Analysis of fiber photometry and calcium imaging data using open-source tools and codes (cont)	Tawan Carvalho, Verónica Domingues Carina Cunha/Ana João Rodrigues	I2.08
Day 11 08/05/2024	Morning	9h-10h	**Lecture** "Building and studying neuronal circuits using microfluidics and microelectrode arrays"	Paulo Aguiar/ Ana João Rodrigues	A1.12
		10h30-11h30	**Seminar** "Effects of cocaine on the neuronal activity within multiple neuronal types of the LDT"	Bárbara Coimbra/ Carina Cunha	A1.12
		11h30-13h30	**Practical session 9 - Group I and Group II** Analysis of 64 channel electrophysiology data: principles and available analysis tools	Leandro Aguiar, Bárbara Coimbra Carina Cunha/Ana João Rodrigues	A1.12
			Lunch break		
	Afternoon	14h30-19h	**Practical session 9 - Group I and Group II** Analysis of 64 channel electrophysiology data: principles and available analysis tools (cont)	Leandro Aguiar, Bárbara Coimbra Carina Cunha/Ana João Rodrigues	A1.12
Day 12 09/05/2024	All day		**SELF STUDY**		
Day 13 10/05/2024	Morning		**SELF STUDY**		
	Afternoon	15h	**Final Exam**	Carina Cunha/Ana João Rodrigues	A2.08