

Quantitative Methods – “Neuroscience-Stream” (16.4.-25.5.2012)

Week 1: Linear systems in time domain [Ad Aertsen (AA), Arvind Kumar (AK)]

Time	Mon, 16.04.12	Tue, 17.04.12	Wed, 18.04.12	Thu, 19.04.12
9-10	Overview / general organization	Basic Python programming	Preparing a seminar	Introduction to protocols
10-12	Linear systems-I (Impulse response) AA	Linear systems-II (Harmonic analysis) AA	Linear systems-III (Correlation analysis) AA	Foundations of dynamical systems AK
12-14	LUNCH			
14-16	Introduction to Linux	Python based exercise	Python based exercise	Python based exercise
16-17	self study	self study	self study	self study

Week 2: Linear Algebra & multidimensional linear systems [Stefan Rotter (SR), Arvind Kumar (AK)]

Time	Mon, 23.4.12	Tue, 24.4.12	Wed, 25.4.12	Thu, 26.4.12
9-10	Student Seminar	Student Seminar	Student Seminar	Student Seminar
10-12	2-Dimensional dynamical systems (Lotka-Volterra equations) SR	Matrix algebra SR	Graph theory SR	Dynamics of multidimensional systems SR
12-14	LUNCH			
14-16	Python based exercise	Python based exercise	Python based exercise	Python based exercise
16-17	self study	self study	self study	self study

Week 3: Signal processing [Arvind Kumar (AK)]

Time	Mon, 30.4.12	Tue, 1.5.12	Wed, 2.5.12	Thu, 3.5.12
9-10		Labour day		
10-12	Digital signals AK	Tag der Arbeit	Signal Processing AK	Stochastic Processes AK
12-14	LUNCH			
14-16	Python based exercise		Python based exercise	Python based exercise
16-17	self study		self study	self study

Week 4: Neuron and network models [Ad Aertsen (AA), Arvind Kumar (AK), Stefan Rotter (SR)]

Time	Mon, 7.5.12	Tue, 8.5.12	Wed, 9.5.12	Thu, 10.5.12
9-10	Student Seminar	Student Seminar	Student Seminar	Student Seminar
10-12	Simple neuron models AA	Hodgkin-Huxley neuron model AK	Simple neuronal networks SR	Network oscillations AK
12-14	LUNCH			
14-16	Python based exercise	Python based exercise	Python based exercise	Python based exercise
16-17	self study	self study	self study	self study

Week 5: Neural data analysis [Ad Aertsen (AA), Arvind Kumar (AK), Stefan Rotter (SR)]

Time	Mon, 14.5.12	Tue, 15.5.12	Wed, 16.5.12	Thu, 17.5.12
9-10	Student Seminar	Student Seminar	Student Seminar	Ascension Day Christi Himmelfahrt
10-12	Data analysis – I (Single neuron activity) SR	Data analysis – II (Single neuron activity) AK	Data analysis – III (Network activity) AA	
12-14	LUNCH			
14-16	Excel based exercise	Excel based exercise	Excel based exercise	
16-17	self study	self study	self study	

Week 6: Advanced topics [Arvind Kumar (AK), Stefan Rotter (SR), Stefan Rensing (SRe), Thomas Speck (TS)]

Time	Mon, 21.5.12	Tue, 22.5.12	Wed, 23.5.12	Thu, 24.5.12
9-10	Student Seminar	Student Seminar	Student Seminar	
10-12	Time frequency analysis AK	Statistical data analysis SR	Decoding of neural activity – application to brain machine interface AA	Common Topics: Pattern formation in networks (NN)
12-14	LUNCH			
14-16	Reading exercise	Reading exercise	Reading exercise	Common Topics: Classification, PCA, Clustering (NN)
16-17	self study	self study	self study	self study

Exercises	Lecture	Seminar
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