

# Review and Preview

Daniela Pamplona

U2IS - ENSTA - IPParis

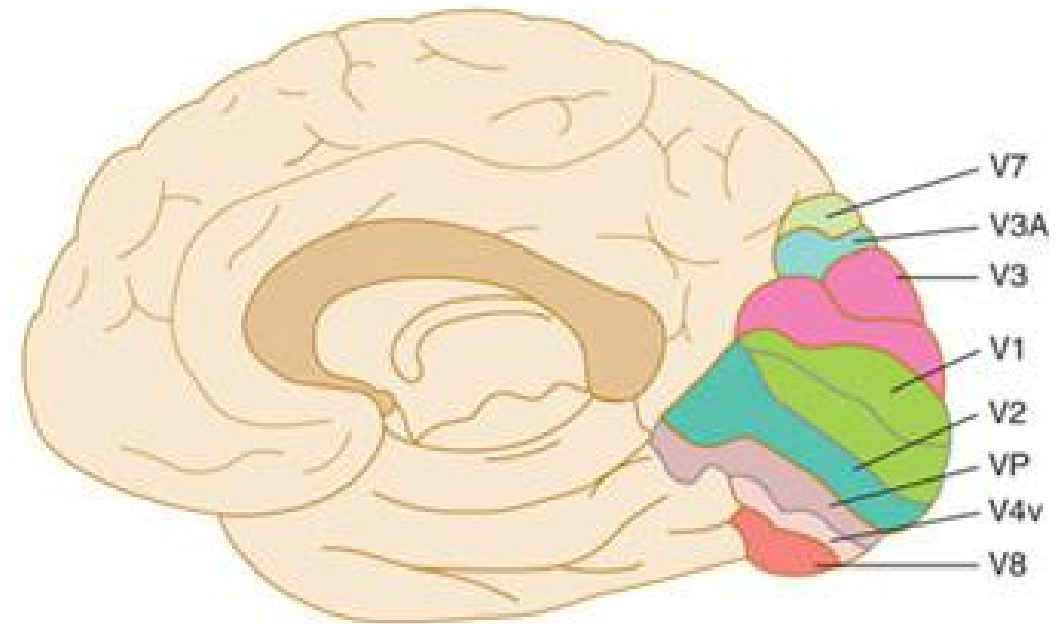
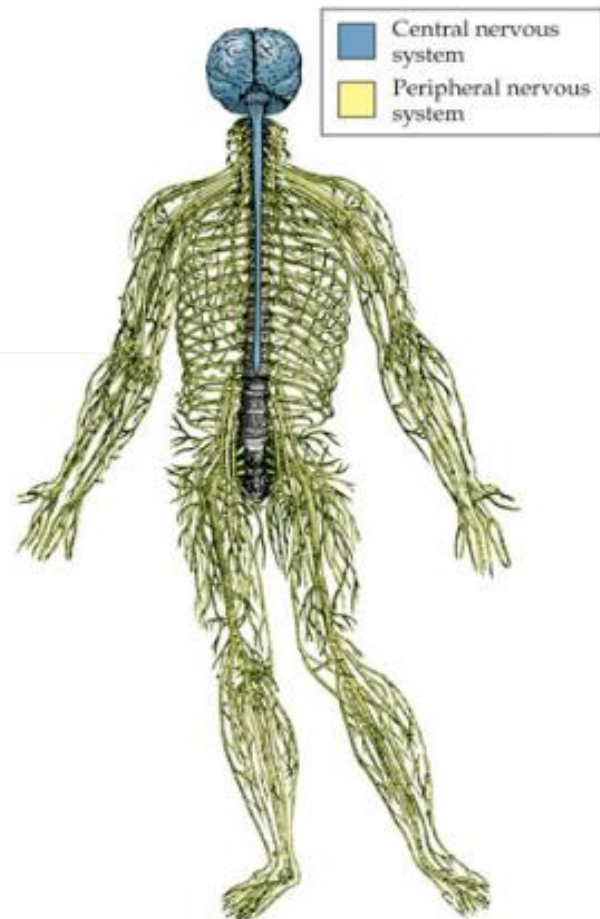
ecampus moodle: MI210 - Modèles neuro-computationnels de  
la vision (P4 - 2020-21)

[daniela.pamplona@ensta.fr](mailto:daniela.pamplona@ensta.fr)

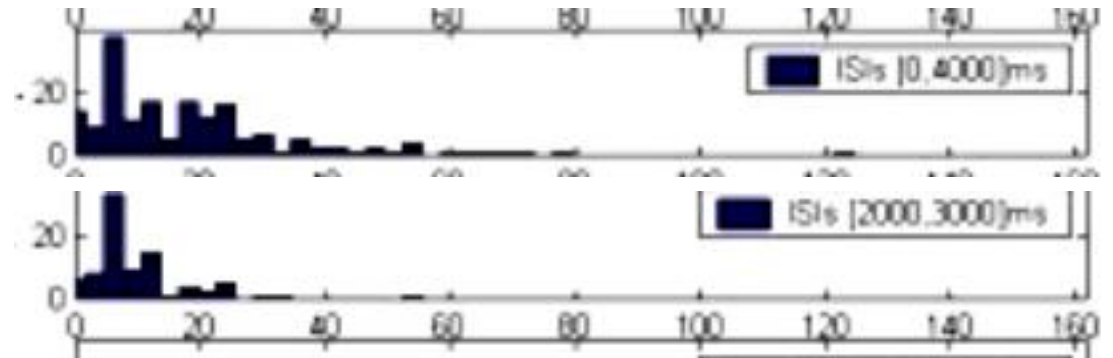
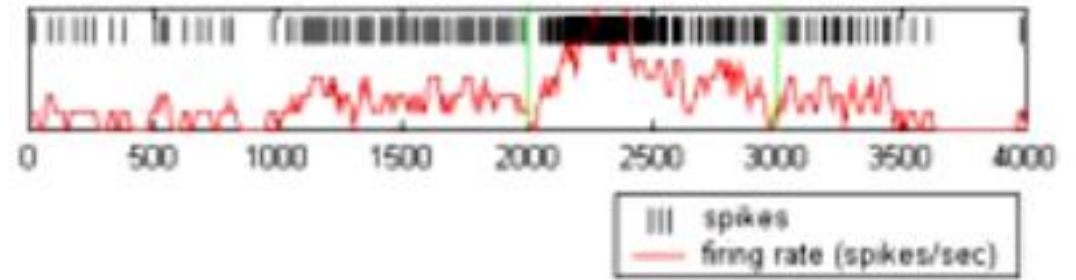
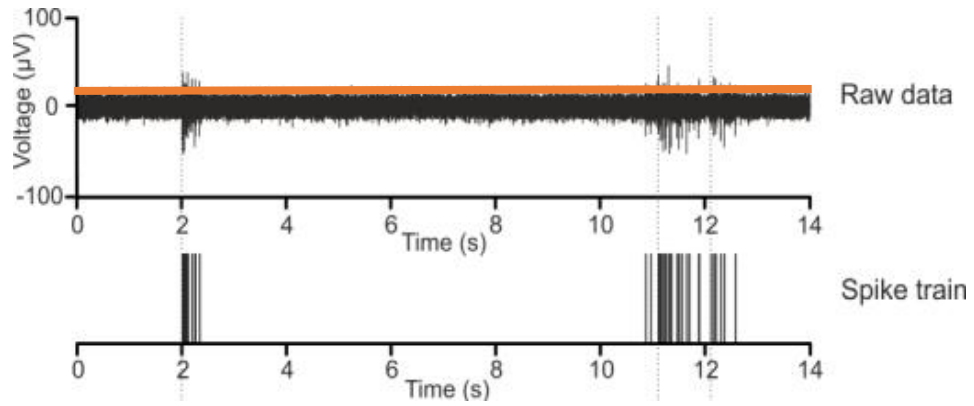
# Plan

Date	Type	Topic	Level of description	Methods
23/03	<b>M + TD</b> written and code	Intro to neuro, neurons, BNN and ANN	Implementational + Computational	Dynamical systems, Neural Networks
30/03	<b>M + TD</b> written	Probabilistic interpretation of visual processing	Computational	Probabilistic/ Bayesian Approaches
06/04	3 M(remote)	Vision and efficient coding	Computational + Algorithmic	Statistics
13/04	3 M (remote)	Receptive Fields, Retina and V1	Computational + Algorithmic	Unsupervised M.L.
27/04	3 TD (remote)	Applications to artificial vision	Computational + Algorithmic	Statistics +Unsupervised M.L.
04/05	<b>M+TD</b> written	Eye movements	Computational + Algorithmic	Reinforcement Learning
11/05	<b>oral</b>	General vision and brain	All	All above

# Chapter 1



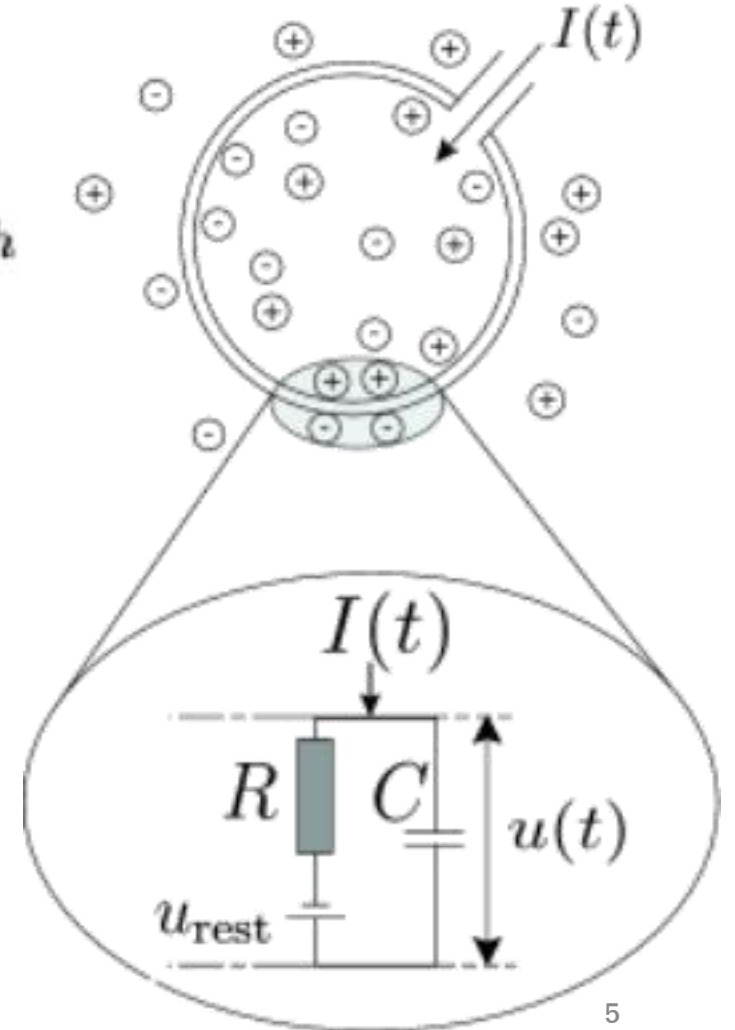
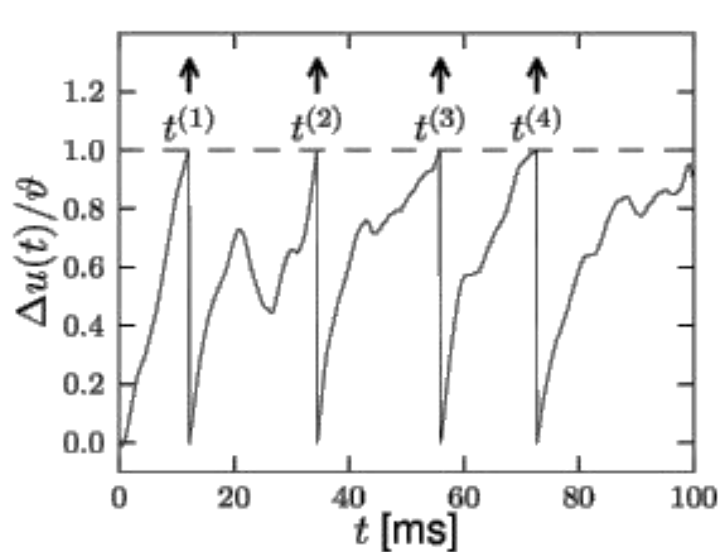
# Chapter 1



# Chapter 1

$$V(t) = \begin{cases} V_{rest} & \text{if } V(t) = v_{th} \\ V_{rest} - \tau \frac{dV}{dt} + RI(t) & \text{o.w.} \end{cases}$$

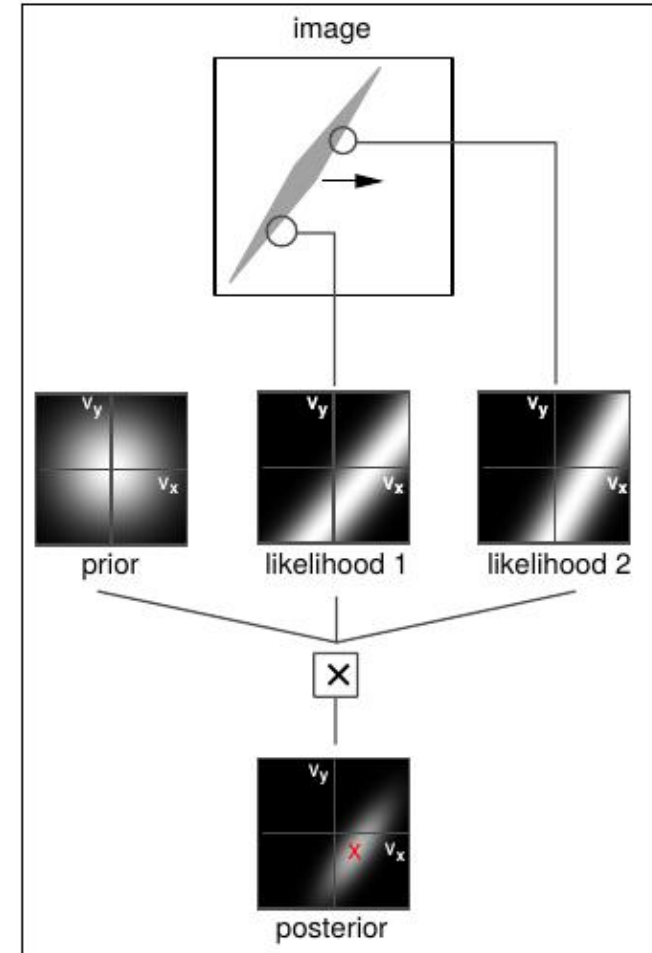
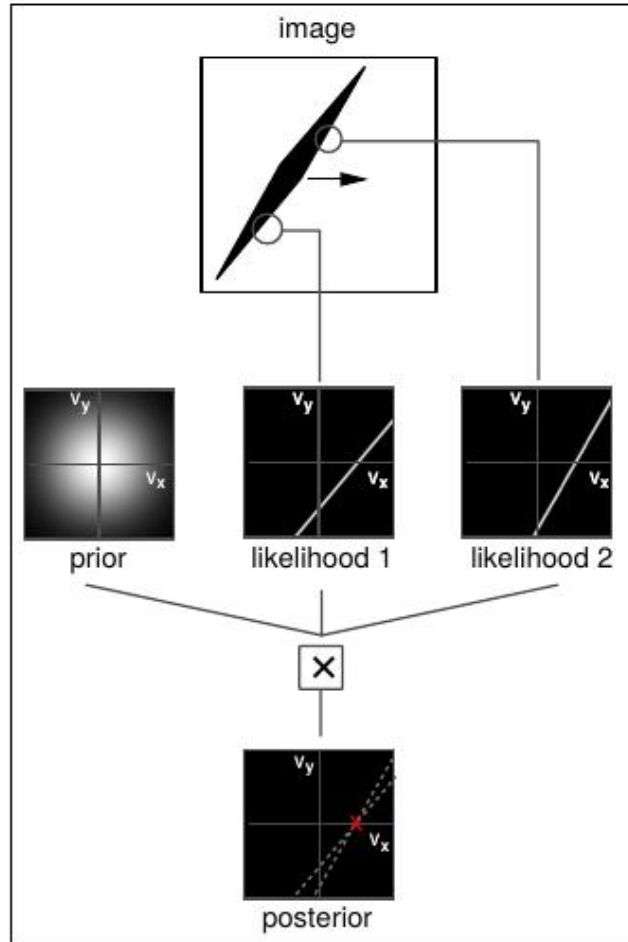
if  $V(t) = v_{th}$   
o.w.



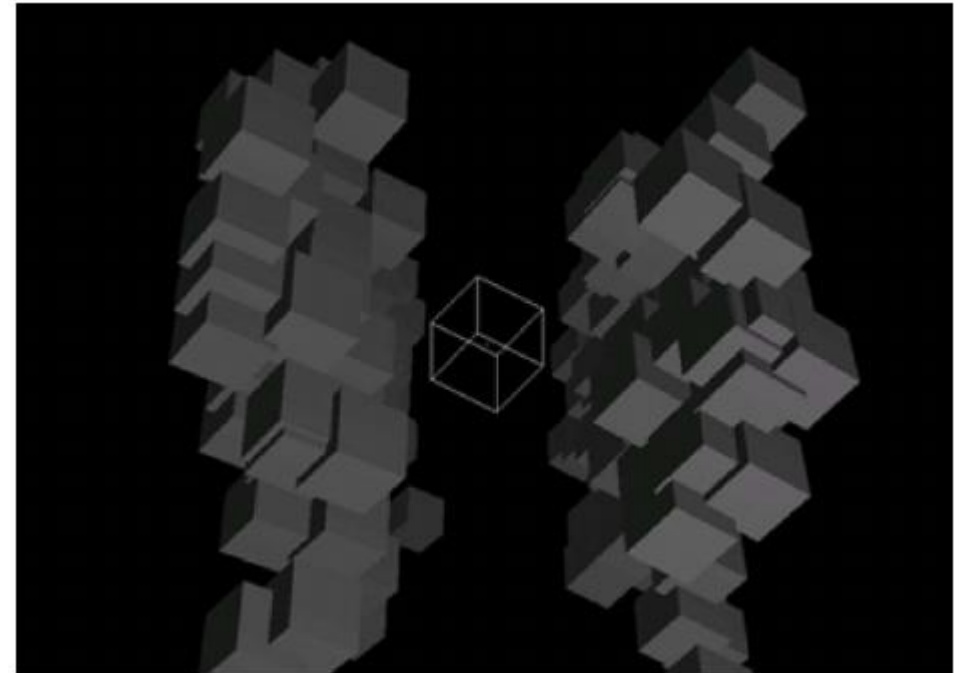
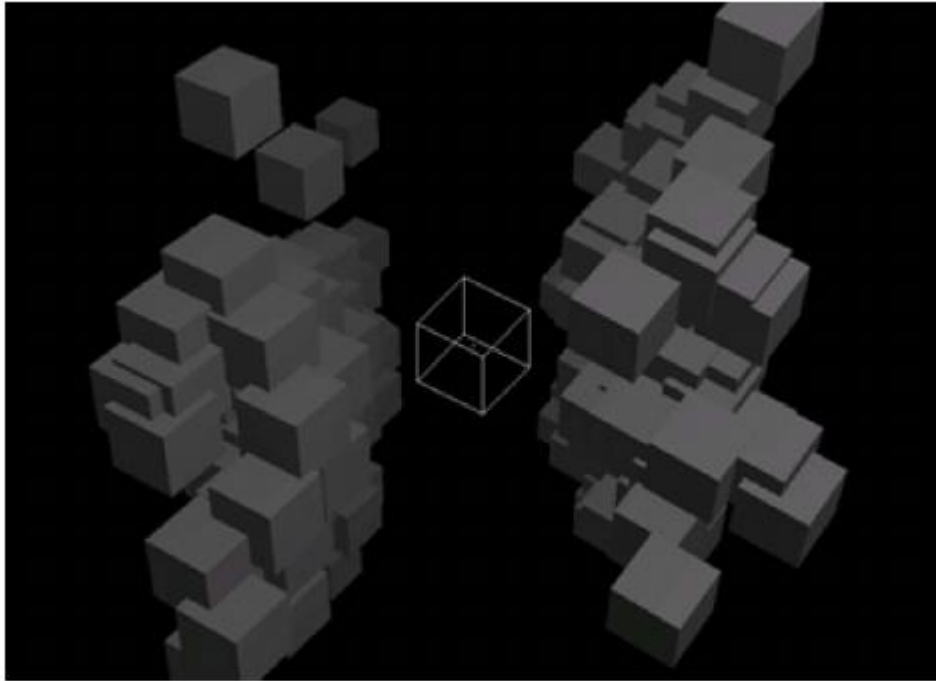
# Plan

Date	Type	Topic	Level of description	Methods
23/03	<b>M + TD</b> written and code	Intro to neuro, neurons, BNN and ANN	Implementational + Computational	Dynamical systems, Neural Networks
30/03	<b>M + TD</b> written	<b>Probabilistic interpretation of visual processing</b>	<b>Computational</b>	<b>Probabilistic/ Bayesian Approaches</b>
06/04	3 M(remote)	Vision and efficient coding	Computational + Algorithmic	Statistics
13/04	3 M (remote)	Receptive Fields, Retina and V1	Computational + Algorithmic	Unsupervised M.L.
27/04	3 TD (remote)	Applications to artificial vision	Computational + Algorithmic	Statistics +Unsupervised M.L.
04/05	<b>M+TD</b> written	Eye movements	Computational + Algorithmic	Reinforcement Learning
11/05	<b>oral</b>	General vision and brain	All	All above

# Chapter 2



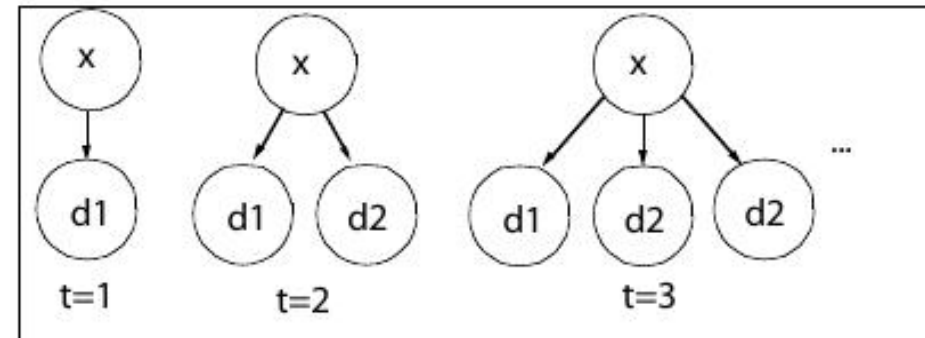
# Chapter 2





# Chapter 2

1. The generative model
- 2. The inference process**
3. The distribution of the MAP estimate



$$p(x | d_1 \cdots d_N) \propto p(x) \prod_{i=1}^N p(d_i | x)$$

$$= p(x) p(d_N | x) \prod_{i=1}^{N-1} p(d_i | x) \propto \boxed{p(x | d_1 \cdots d_{N-1})} p(d_N | x)$$

The posterior at time  $N-1$  is the prior at time  $N$

# Plan

Date	Type	Topic	Level of description	Methods
23/03	<b>M + TD</b> written and code	Intro to neuro, neurons, BNN and ANN	Implementational + Computational	Dynamical systems, Neural Networks
30/03	<b>M + TD</b> written	Probabilistic interpretation of visual processing	Computational	Probabilistic/ Bayesian Approaches
06/04	<b>3 M(remote)</b>	<b>Vision and efficient coding</b>	<b>Computational + Algorithmic</b>	<b>Statistics</b>
13/04	<b>3 M (remote)</b>	Receptive Fields, Retina and V1	Computational + Algorithmic	Unsupervised M.L.
27/04	<b>3 TD (remote)</b>	Applications to artificial vision	Computational + Algorithmic	Statistics +Unsupervised M.L.
04/05	<b>M+TD</b> written	Eye movements	Computational + Algorithmic	Reinforcement Learning
11/05	<b>oral</b>	General vision and brain	All	All above

# Today

1. Definition and properties of Receptive Fields
2. Tour on the visual pathway
3. Natural Images statistics

