

NSCI 401

## Final exam questions

(Fall 2013)

1. What are the pros and cons of the following spiking neuron models: Hodgkin-Huxley, Leaky Integrate and Fire, Izhikevich?
2. What do spike statistics (e.g. Poisson distribution or inter-spike intervals) tell us?
3. Explain how and why neuronal maps emerge and what they tell us about brain function.
4. Describe one example application of Bayesian inference in Neuroscience and how it works.
5. What are the building blocks of a saccadic eye movement model? Why are these elements needed and what do they do?
6. How does the choice of the cost function in Optimal Feedback Control (OFC) shape the motor response? Why is OFC superior to other motor control models?
7. How do diffusion models describe decision making processes in the brain? Why are diffusion models better than race models?
8. Describe the Tsotsos attention model. What can it do that the Itti model cannot do?
9. How does Hebbian learning work?
10. What are the potential mechanisms underlying short-term memory?

**Note:** during the exam, there are *no aids allowed*. Don't forget to bring your Queen's students photo ID to the exam!