**AI vision systems and biological vision**

Simon Thorpe

State-of-the-art deep learning trained vision systems outperform humans in many tasks. They have feed-forward processing architectures that look surprisingly like those used in the human visual system. But many key features of biological vision are still missing from most current AI vision systems. In this talk, I will concentrate on two main ideas that depend on neurons transmitting information using spikes – not floating-point numbers. First, codes based on the order of firing of neurons can allow information to be processed very efficiently, even with extremely sparse firing. This may be a key reason for the remarkable power efficiency of the brain. Second, I will look at processing using binary synaptic weights rather than continuously varying weights used in deep learning. I will talk about learning rules that effectively rearrange these binary weights to match repeating input patterns. Such rules allow rapid unsupervised learning that is much more plausible than conventional back-propagation based deep learning schemes.