



# PHYSICS AND ASTRONOMY ARCNet SPECIAL SEMINAR

## JARED KEOWN

Astronomy PhD Student, UVic

### **“From AGN to molecular clouds: Neural networks in extragalactic and galactic contexts”**

#### Abstract

I will highlight the versatility of neural networks as classifiers by presenting their application to problems in two vastly different fields of astronomy:

1) Fuelled by the accretion of material onto a supermassive black hole, the Active Galactic Nuclei (AGN) found at the centres of many galaxies are among the most powerful sources of energy production in the universe. Understanding the dynamics and evolution of AGN requires accurately separating AGN-host galaxies from Star-Forming (SF) galaxies that lack AGN. We present a new method for classifying AGN & SF galaxies using a neural network trained with optical spectral features observed by the Sloan Digital Sky Survey. Our model shows that accurate classifications can be made using information from only two emission lines ([OIII] & H $\beta$ ) and the 4000Å break, making it easier to compare AGN & SF galaxies at higher redshifts ( $z > 0.4$ ).

2) Measuring the motions and stability of dense gas structures in star-forming molecular clouds requires accurate modelling of their emission lines. When multiple gas structures at significantly different radial velocities overlap along the line-of-sight, their emission becomes non-Gaussian and often exhibits two distinct peaks. Traditional line-fitting techniques fail to adequately account for these double-peaked profiles, providing inaccurate cloud kinematics measurements. We present a new method for distinguishing between single- and two-component emission lines using a convolutional neural network trained with synthetic spectra. Our model is able to correctly identify faint second peaks in real observations that are missed by traditional line-fitting methods, showcasing the advantage that neural networks can provide for spectral analyses.

Monday, November 26, 2018

10:00 a.m.

CLE – Room A314