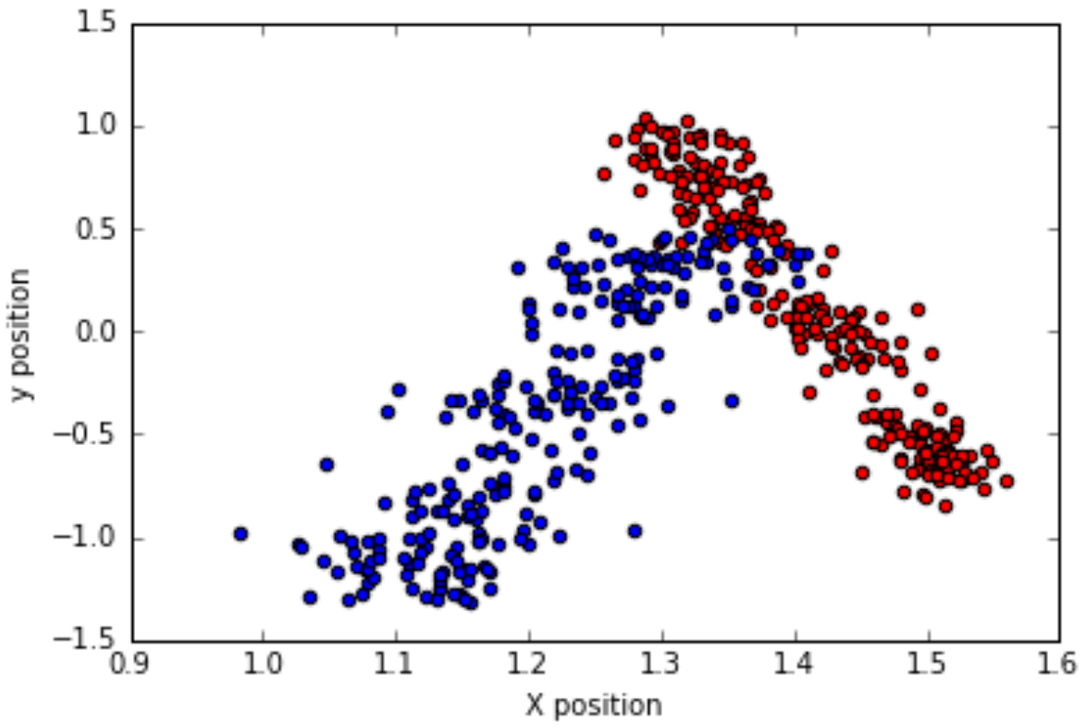
HW 9: Bayesian Inference

due Nov 11 @ 5pm

Inferreing underlying properties of physical systems is a fairly ubiquitous requirement in data-driven fields. The following problem involves inferring the motion properties of two objects given (noisy, finite #) measurements over time.



the observed location data looks like:

	red_pos_X	red_pos_Y	blue_pos_X	blue_pos_Y
t				
1.471495	1.319862	1.020535	1.156609	-1.320279
3.474547	1.287172	1.035155	1.148328	-1.279096
6.499981	1.281325	0.983152	1.063136	-1.307599
8.514691	1.302247	0.977130	1.122684	-1.284657
12.614129	1.299199	0.974123	1.054871	-1.167385
14.230305	1.292565	0.997879	1.034915	-1.281183

Assume both objects move at a fixed speed/direction, and assume that there is a fixed measurement error (ie. the observed location in **x**,**y** is the true location plus some Gaussian random noise at time ***t***).

Use PyMC and Bayesian inference to answer the following questions:

a) What is the posterior of the speed of each object?

b) What is the 5 and 95% confidence interval of the time range when object A's true Y value is => 0 AND B's Y value <=0?

c) If objects A and B are known to be moving at the same speed, how does you answer in a and b change?

d) Repeat your answers for a-c by using only the first 100 measurements? Do the changes make sense?