Week 11 meeting notes

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| Discussion of how my neural net is training very slowly.  Guy says when he has a grid which is too large he splits it into multiple batches.  Guy takes out the pre-main sequence points when he trains his neural nets.  Test neural net using google collab to estimate how long it will take to run on the GPU (the GPU should be 1.5 times faster than good collab) |
| We are now collaborators on the interstellar project:  DON’T ADD FILES, but we can contribute.  Pip installable package  Tars: manages data – links to RDS (Research Data Store (UoB’s data storage)) can load in the data stored in RDS and load it into a data frame.  Murphy: stores a grid of neural networks: we give x list of training inputs, y list of training outputs etc. it handles the modelling making and training.  Note: if you have a grid with diffusion then metallicity does not stay the same throughout the stars evolution. So we would have to train on initial metallicity and output star metallicity/star FeH.  To change something on Interstellar:  1. Fork the repo, 2. Make a new branch, 3. Make the changes, 4. Push back and create a pull request.  The pull request will make sure we pass the continuance integration and it will be reviewed by one of the other members.  If we can Guy to run a file using interstellar there a template in Murphy, which begins:  If \_\_name\_\_ == “\_\_main\_\_”:  But we do need to of course import interstellar  There could be issues with installing interstellar on google collab but we can’t mount RDS on it.  So in this case we would want a pickled file or a CSV file like with the grids we’ve been using. |
| If we used Interstellar we should understand it so we can answer questions in the seminar.  Also if we use Interstellar we should remember to acknowledge that we collaborated we them in our report. |
| Discussion of HBMs and the issues that are currently trying to be solved.  A work around for sampler issues: full rank ADVI = variational inference allows us to approximate the posterior distribution but instead of drawing samples from the distribution, it approximates it using a multivariate Gaussian distribution and tries to estimate the parameters of the multivariate Gaussian distribution. i.e. it turns a sampling problem into a minimization problem. See the Interstellar code (alphaSen notebook?, it contains 3 lines on what you need to do this).  Guy is currently drawing values from a Beta distribution which is then scaled to the correct range.  (creates values between 0 and 1, which can then be scaled say for age to be between 0 age and the max age of the distribution.) Guy only uses alpha=Beta Beta distributions because he wants to make a weakly informative prior but limits the parameters to the valid inputs of the grid, with the caveat that it doesn’t treat that the valid inputs for the grid do not span all ages for all masses.  Potentially the sampler is trying to explore all parameter space but we don’t have data for all parameter space e.g. 12Gyr old white dwarfs (initially high mass stars that have been white dwarfs for a long time)  Then a short discussion of Beta distributions.  000\_bestmode.h5 is one of the best models in the Interstellar which we can have a look at |
| Seminars: first 2 weeks of Spring term – 25 minutes per person (don’t know if this involves the questions), 16th, 17th, 21st, 23rd January are when they takes place, don’t know which date we are yet.  It’s about presenting where the project is and where we hope it to be.  Can show some neural net results and explain Hierarchical modelling. Explain how we got to each point.  Show DeStello results potentially  Show how we trained neural net and that it does a good job of reproducing data i.e. HR plots.  Formation timescale would be interesting for M67 and what is M67’s mass and age.  We will have posterior estimate on initial helium and initial metallicity, which would allows us to calculate our estimate given M67 of the helium enrichment relation. |
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Students To Do:  
- Try running neural nets on google collab (both for training and for estimating run durations + determining whether it’s working properly i.e. train for 10k epochs and then check how it is doing).  
- Figure out and tell Guy how we want to use Interstellar (if we don’t want to use RDS and all that Guy can mound RDS, create the data frame and pickle it and then give us the pickled file)  
  
Harry:   
- Consider using early stopping callbacks  
- Consider changing code to single precision  
- Take out pre-main sequence points from grid (less than 1Gyr)

Guy to do:

All to do?:  
- Think about how to “mount RDS”

Next week: No meeting because Christmas