Modelling the spread of a coronavirus

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1 4H Project

Divide a population into compartments.

S = susceptibles

I = infected

R = recovered or dead

E = infected but not yet infectious

This project investigates ordinary differential equation models for interactions between S and I (SI models), SIR, and $SEIR$. A background to this may be found in the review article of Hethcote [2]. A very readable account where the infection is covid 19 is in Brandi et al. [1].

The articles by Wang and Ruan [4] and Ruan et al. [3] deal with specific modelling of the SARS virus.

There are many, many articles on modelling covid 19. Some very interesting reports may be found in the work of my former (Durham) students Helen Coupland, Gina Cuomo, and Caroline Walters who are at Imperial College, Faculty of Medicine, School of Public Health. Their work can be found by googling their name followed by Imperial.

This project will involve numerical solution of ordinary diffential equations. Training in the computational aspects will not be given.

References

[1] P. Brandi, R. Ceppitelli, and A. Salvadori. Epidemic evolution models to the test of covid - 19. *Bolletino dell'Unione Matematica Italiana*, 13:573–583, 2020.

[2] H. W. Hethcote. The mathematics of infectious diseases. *SIAM Review*, 42: 599–653, 2000.

[3] S. Ruan, W. Wang, and S. Levin. The effect of global travel on the spread of SARS. *Math. Biosciences and Engineering*, 3:205–218, 2006.

[4] W. Wang and S. Ruan. Simulating the SARS outbreak in Beijing with limited data. *J. Theoretical Biology*, 227:369–379, 2004.