Supervisor: **Yanghong Huang**

1	Project Titles	Pattern formation of Reaction-diffusion equations with chemotaxis		
2	Category	Applied		
3	Level	3/4		
4	Semesters (length of project)	2		
5	Description	Many existing equations in pattern formation, like the well-known Gray-Scott system or Gierer-Meinhardt system, usually consist of two components (activator-substrate or activator-inhibitor). In this project, a three-component system proposed in [1] is further studied, using the numerical method proposed in [2], to clarify the following questions: • The dependence of the pattern on the parameters • Construction of the spike solutions using singular perturbation • Possible reduction of the original equations in [1] to understand the key terms and mechanisms for the pattern formation		
6	References	1. R Tyson, SR Lubkin, James D Murray. A minimal mechanism for bacterial pattern formation. *Proceedings of the Royal Society of London B: Biological Sciences* 266(1416): 299-304. 1999 2. A Chertock, A Kurganov. A second-order positivity preserving central-upwind scheme for chemotaxis and haptotaxis models. *Numerische Mathematik* 111(2), 169-205		
7	Prerequisite courses	A basic knowledge of partial differential equations	A basic understanding of finite difference methods for PDEs	
8	Additional notes	The students are encouraged to talk to me about the details. Other possible projects (subject to available) can be found on the webpage: personalpages.manchester.ac.uk/staff/yanghong.huang/Projects/		