

## **And the secret of good bread is...?**

**Project Supervisor : Dr. Ravi Jagadeeshan**  
**Contact: Dr. Ravi Jagadeeshan**

**Department: Chemical Engineering**

**Any pre-requisite subjects:**

---

### **The Problem**

That is something that the billion-dollar baking industry in Australia would dearly love to know! Although people have been making bread for thousands of years, automating the process and ensuring uniformity in quality has always been a technological challenge.

One of the key elements of bread-making is the process of kneading and rolling the dough before leavening and baking. The final quality of the bread depends crucially on carefully controlling this process. Designing and controlling process equipment to perform this task however requires a thorough knowledge of how the dough will behave in response to the stresses and strains imposed in the equipment.

### **The Project**

Only recently have researchers begun to understand more about the complex material that is dough. This project is a part of a collaborative effort between Monash and CSIRO, Perth. It involves understanding a new model of stress-strain behaviour of dough, and implementing this model in computer simulations of the rolling process using commercial FEM software.

We will spend the first half of the project understanding how materials like dough share the characteristics of both liquids and solids. This will require us to implement the mathematical model of the stress-strain behaviour of dough in MATLAB, and examine its response in simple experiments. One of the interesting aspects of the model is that it attempts to describe how the internal structure of dough influences its behaviour, and we will use MATLAB to explore the effect of microstructure. During this time, we will also learn how to use the commercial FEM software. In the second part of the project, we will setup simulations of dough rolling, and compare results with those available in literature.

The project requires a good background in basic engineering mathematics (ordinary differential equations, matrices, etc.), and some familiarity with MATLAB. Experience with COMSOL or ABAQUS would be great, but not essential.