

CT5141 Lab Week 1

James McDermott

1. Recall the **spherical rocks problem**. E.g., this is a very small, flat, triangular rock:

```
[[[0,1,0],  
  [0,1,1],  
  [0,0,0]],  
 [[0,1,0],  
  [0,1,1],  
  [0,0,0]],  
 [[0,0,0],  
  [0,0,0],  
  [0,0,0]]]
```

How would you measure sphericalness? This is a conceptual question – you don’t have to write code.

2. Recall the **binary guessing game**. How does the size of the space grow as bitstring length n grows?
3. For each guess x , we received $f(x)$, a single number. What if, instead, we received more information – e.g. exactly **which** bits are incorrect?
4. Can you think of **another optimisation problem**, that we haven’t already mentioned, that arises in e.g. industry, science, politics, everyday life (but please, not in machine learning)? It doesn’t have to be one that we solve using **code**. It doesn’t even have to be one that we always **notice** when we encounter it. Try to think of one that no-one else will think of.
 - What is the search space?
 - What is the objective function? Are we maximising or minimising?
 - Are there constraints?
 - How do we solve it, in practice?
5. Recall the **kids’ party problem**. I’m going to host a party for 10 small kids. They’ll eat sausages (EUR5/kg), chips (EUR2/kg), and ice-cream (EUR4/kg). The kids don’t care what they get so long as they get 500g of food each. Suppose I don’t care about their health.
 - What is the search space?
 - What is the objective function? Are we maximising or minimising?
 - Are there constraints?