

# CT5141 Lab Week 1

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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?