COMP1531

5.2 Measures & Estimation

How long is a piece of string?

How big is facebook?

How much effort does it take to build a boat?

Measurement

- A process by which numbers or symbols are assigned to properties of objects
- For example:
  - Measuring the height of a bookshelf
- Have little values themselves, but do relative to how we use them or what meaning we give them
- For example:
  - The height of the bookshelf is useful to know if we need to fit it under a door

Software Measurement

- Cost or effort to produce the software
- Code coverage
- Code quality
- Software complexity

Measurement Scales

- In measurement theory we have the following scales:
  - Nominal
  - Ordinal
  - Interval
  - Ratio
  - Absolute
- They classify measures by how different values of that measure can be compared

Nominal Scale

- Group subjects into different categories
- For example, the weather can be sunny, cloudy, rainy or snowy
- Two key properties:
  - Mutually exclusive: measured attribute falls into one and only one category
  - Jointly exhaustive: categories cover all possible values of the attribute

Ordinal scale

- Subjects can be compared in order
- For example:
  - "Bad", "Good", "Excellent"
  - Star ratings
- Key properties:
  - Asymmetry: if A > B is true then B > A is false
  - Transitivity: if A > B and B > C then A > C
- Offer no information about the relative magnitude of the difference between measurements
  - E.g. There's no concept of how much better "Excellent" is than "Good"

Interval scale

- Exact differences between measurement points
- For example:
  - Degrees celsius: 30° is 10° hotter than 20°
- Addition and subtraction can be applied, but no other arithmetic operations
- No true zero point

Ratio scale

- Has a absolute or non-arbitrary zero point
- For example:
  - Degrees Kelvin
  - Length in CM
- Can have addition, subtraction, multiplication and division applied to them
- Have relative ratios:
  - E.g. 20CM is twice as long as 10CM

Absolute scale

- Only one way to measure a property
- For example:
  - How many chairs are in this room?

How accurate does a measure need to be?

Encountered so far

- Code coverage
  - Line coverage and branch coverage are ratio scales
- Pylint score
  - An ordinal scale

Code coverage

- Determined by how much of a codebase is executed
- Tends to correlate with test coverage
- Usually by lines or statements
- Has a zero point, but is it an ratio or interval measure?

Pylint Score

- A scoring based on problems identified in code
- Is it a ratio, interval, or only an ordinal measure?
  - Has a zero point, but it's arbitrary
  - How much better is a score of 8 compared to a score of 5?
- How useful is it really?

When a measure becomes a target, it ceases to be a good measure.

-- Goodhart's Law

Effort

- How much time or work does it take to do something?
- Typically estimated
- Necessary for planning

Time estimates

- Estimate how long something is going to take in hours or minutes
- Tends to be inaccurate
- Different for every person
  - What takes me 4 hours might take you only 2

T-shirt sizes

- Classify work into small, medium, large, extra large, etc.
- An ordinal scale
- More likely to be accurate as more coarse grain
- Requires common understanding of what the sizes mean and relative difference between them

Story points

- Assign a number of points to each user story
- Typically taken from an approximate fibonacci sequence
  - E.g., 0, 1, 2, 3, 5, 8, 13, 20, 40 and 100
- A ratio scale
  - E.g., a 2 point story should take twice as much effort as a 1 point story
- Individual independent. Points are the same for all team members
- Only requires **one** baseline

Planning Poker

- A technique for coming up with story point estimates as a team
- For each story:
  1. It is discussed amongst the team
  2. Each member decides a point estimate privately
  3. Everyone reveals their estimate at once
  4. If all estimates are **not** the same, members discuss and give reasons for their estimates
  5. Repeat previous steps till estimate converge
- Can be done with sets of cards or just writing numbers down on pieces of paper
- Also, planningpoker.com

Estimation Practice

- Go to https://forms.gle/fMHKCrhjZhLcm9Dv6
- Follow the instructions and come up with your own estimates
- We'll analyse them as a class

Further reading

- A good introduction to story points:
  - https://www.atlassian.com/agile/project-management/estimation
- Why story points should not be equated to time
  - https://www.mountaingoatsoftware.com/blog/dont-equate-story-points-to-hours
- Why the fibonacci sequence:
  - https://www.mountaingoatsoftware.com/blog/why-the-fibonacci-sequence-works-well-for-estimating