Setting the Scene

Information Technology is ubiquitous in modern society, which presents both advantages but also challenges when teaching it as an academic discipline. In our experience teaching university and high school students we identified a number of problems:

1. School students in remote and rural Australia often lack access to people with sufficient expertise in modern computing.
2. Learning programming requires regular feedback to correct errors and most undergraduate courses have limited supervised laboratory and tutorial hours.
3. Marking code submitted for assignments and exams is time-consuming and difficult to do without running the programs and testing their output.

Students are enthusiastic adopters of new technology, so with this in mind we developed the Challenge website, an online environment for learning programming. The Challenge site also provides support for assessment submission, marking, and online student communities.

The Students

We have developed this system with several student groups in mind:

- **Advanced First Year Students** — The Challenge site allows us to provide many practice questions and extension activities for our top IT students in INFO1903 Informatics (Advanced).
- **High School Students** — Each year 1500 students from around Australia participate in our NCSS online programming challenge which uses the site.
- **First Year Engineering Students** — We rolled out the Challenge site for use with MATLAB for 750 engineering students doing ENGG1801 Engineering Computing.

A Resource for Education Research

The Challenge site also helps us to learn about teaching programming. We now have a database of:

- Over 200 000 student submissions
- Over 20 000 forum posts about programming problems

This database includes 73 unique incorrect solutions to the classic program “Hello World”. Analysis of this data will help us understand common programming misconceptions.

We estimate that the feedback high school students received through the online challenge is equivalent to over 5000 hours of teacher time.

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Figure 1: A typical beginners question used in INFO1903 and the NCSS Challenge which are both run in the Python programming language.

Figure 2: A typical engineering question in MATLAB from ENGG1801. Students receive immediate feedback on their solutions.

Figure 3: Students can access self-contained notes on relevant aspects of each module. Teachers can print these and use them as an in-class resource.