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# COSMIC: US-based Conversion Master's Degree in Computing

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## ABSTRACT

COSMIC is an NSF S-STEM graduate curriculum initiative / conversion program that strives to provide an accelerated pathway to a Master of Science (MS) degree for individuals who do not have an undergraduate degree in computing, but who wish to cross over into the computing field. The structure of our conversion program, the context that motivated it, and insights from conversion students' instructors are presented. Program successes with students from under-represented populations and the limitations that are also experienced are discussed. Our conversion program is based on a highly focused summer bridge course, combined with a customized curriculum pathway

that enables people without undergraduate computing degrees to merge quickly and efficiently into a professional MS in computing degree program. The program is similar in concept to post-baccalaureate conversion programs in New Zealand (e.g., the Master of Software Development at the Victoria University of Wellington) and the extensive conversion choices in the UK. Undergraduate and graduate student enrollment statistics from past and current (2018) CRA Taulbee Surveys strongly suggest the computing profession has a moral obligation to seek out and encourage individuals from under-represented populations to become a significant part of the computing professional community. We encourage other institutions to join in the effort to recruit and provide pathways for post-baccalaureate individuals from under-represented populations to become a significant part of the computing community.

## CCS CONCEPTS

- Social and professional topics → Model curricula.

## KEYWORDS

Conversion program, curriculum initiative, master's degree, NSF S-STEM, non-traditional students, under-represented populations.

## 1 CONTEXT AND COSMIC PROGRAM

Unlike some countries (e.g., UK and New Zealand), there are few US-based accelerated conversion programs for individuals whose undergraduate study contained little formal training in computing. The literature on computing conversion programs appears limited, e.g., [1–4]. This report details our experience providing an accelerated pathway into an MS in Computing degree program. Our program begins with a summer-based, 11 week/5 days a week/8 hours a day, face-to-face bridge course whose major components are programming, professional practice, SQL, OS commands and scripting, data structures and algorithms, team project and computing culture. After the bridge course, students take Principles of Database Systems, Elements of Software Development, and Professional Seminar in Computing to continue their introduction to computing, as well as provide students with skills to be discussed at internship interviews.

## 2 METHODS/RESULTS

We present cohort demographics, student impressions pre- and post-bridge course and impressions of consenting instructors who had one or more of the cohort students in class, spring 2019. The instructor survey was to determine which aspects of the conversion students' knowledge, achievements, and interactions were sufficient or deficient for coursework in the MS program. At that time, the first cohort was near graduation and the second cohort was approximately half-way to graduation. NSF S-STEM cohorts are routinely small, so our study has quantitative limitations. However, we are encouraged by the success of the 8 members of our first cohort: Graduates are employed as a risk analyst, an IT security analyst, a marketing data analyst and one graduate who decided to return to their original career; 2 do not anticipate completing the program but both are working in IT, and we are encouraged by completion plans of the other 2 members. That all students in our second cohort obtained a computing-related summer internship for summer 2019 is promising.

### 3 ACKNOWLEDGMENTS

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### REFERENCES

- [1] Helen M. Edwards and J. Barrie Thompson. 2003. Reflections on a UK Masters Level Software Engineering Programme Intended for the Home and International Market. In Proceedings of the 16th Conference on Software Engineering Education and Training (CSEET '03). IEEE Computer Society, Washington, DC, USA, 166–. <http://dl.acm.org/citation.cfm?id=794194.794951>
- [2] Karsten Lundqvist, Craig Anslow, Michael Homer, Kris Bubendorfer, and Dale Carnegie. 2018. An Agile Conversion Masters Degree Programme in Software Development. In Proceedings of the 49th ACM Technical Symposium on Computer Science Education (SIGCSE '18). ACM, New York, NY, USA, 846–851. <https://doi.org/10.1145/3159450.3159540>
- [3] Robin Mellors-Bourne and Keith Williams. 2019. Evaluation of a scheme to develop pilot engineering and computing conversion Masters courses. March 2019. Office for Students, Bristol, England, UK.
- [4] J. Barrie Thompson and Helen M. Edwards. 1999. Providing New Graduate Opportunities: Experiences with a UK Master's Level Computing Conversion Course. *J. Syst. Softw.* 49, 2-3 (Dec. 1999), 135–143. [https://doi.org/10.1016/S0164-1212\(99\)00086-2](https://doi.org/10.1016/S0164-1212(99)00086-2)

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