St. Francis Xavier University
Department of Computer Science

CSCI 435: Algorithms and Complexity
Extending Tractability — Discussion Questions
Winter 2025

[DF11] Rodney G. Downey and Dimitrios M. Thilikos. Confronting Intractability via Parameters. *Computer Science Review*, 5:279–317, 2011.

Rod Downey is an emeritus professor at Victoria University of Wellington in New Zealand whose research focuses in particular on parameterized complexity theory. He has authored hundreds of papers as well as a half-dozen books on the subject and is a world-renowned expert. Dimitrios Thilikos is a researcher at LIRMM in France whose work also focuses in part on parameterized complexity theory.

1. What makes a problem "fixed parameter tractable"? Why might we want to know whether a difficult problem is fixed parameter tractable?

2. Consider the discussion of the DOMINATING-SET problem. What are all of the different ways in which we can parameterize this problem? What are some of the benefits of parameterizing this problem in a certain way?

3. What does it mean for a problem to belong to the class W[1]? What are some examples of problems in this class, and why might we care that a problem belongs to this class?

4. Consider our discussions on extending tractability from our lectures. Of the problems we discussed in class, what changes did we need to make (e.g., which parameters did we need to fix) in order to render the problem tractable?

5. Find one other example of a problem that can be made fixed parameter tractable, and explain how we can do so.