# Homework 2: Code Contracts

http://d3s.mff.cuni.cz



Pavel Parízek



**CHARLES UNIVERSITY IN PRAGUE** 

faculty of mathematics and physics

- Implement data structure in C#
  - Elements: integer type, duplicates allowed
  - Access: using element index or actual value
  - Operations
    - void Add(int val)
    - int Get(int index)
    - int GetHigher(int val)
      - It should return the least element greater than val
    - void Remove(int index)
    - void RemoveAll(int val)
    - void Sort()
    - int FindMin()
    - bool Contains(int val)
    - void Clear()
    - int Size()



- Define contracts for all operations provided by your data structure
  - Contracts should capture the expected behavior
    - All typical usage patterns supported by the operations
  - Try to cover also some important corner cases
    - Example: index out of bounds

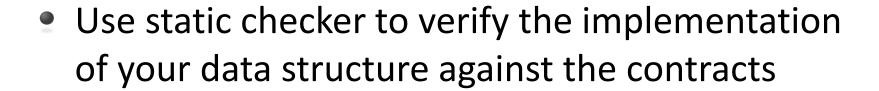


- Write small test client for the data structure
  - It should exercise typical usage patterns and some important corners cases

- Note for tasks 1+3
  - We will not judge the quality of your code in C#
    - Some prefer and use other languages (Java, C, C++, ...)



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Use the runtime checker on your small test client

- Necessary software
  - Visual Studio + plugins for Code Contracts
    - https://www.microsoft.com/en-us/research/project/code-contracts/



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- Informally describe what non-trivial properties you specified using Code Contracts
  - "why you did what you did"
- Positive experience: what contracts (properties) you were able to successfully verify
- Negative experience: what are the major observed limitations of Code Contracts
- For each reported spurious error (if you get some), try to explain why the particular checker reported the error in your opinion
- Also discuss missed errors (and possible reasons)



### **Alternative: Viper**

- You are allowed to use Viper (language, tools) instead of C# and Code Contracts
  - http://viper.ethz.ch/
  - Online web interface
  - Plugin for VS Code
  - No runtime checker
- Special task
  - Compare abilities of VC generator and symbolic execution
- Read the tutorial
  - http://viper.ethz.ch/tutorial/



## Organization

Deadline: 2.5.2019

- Submission
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