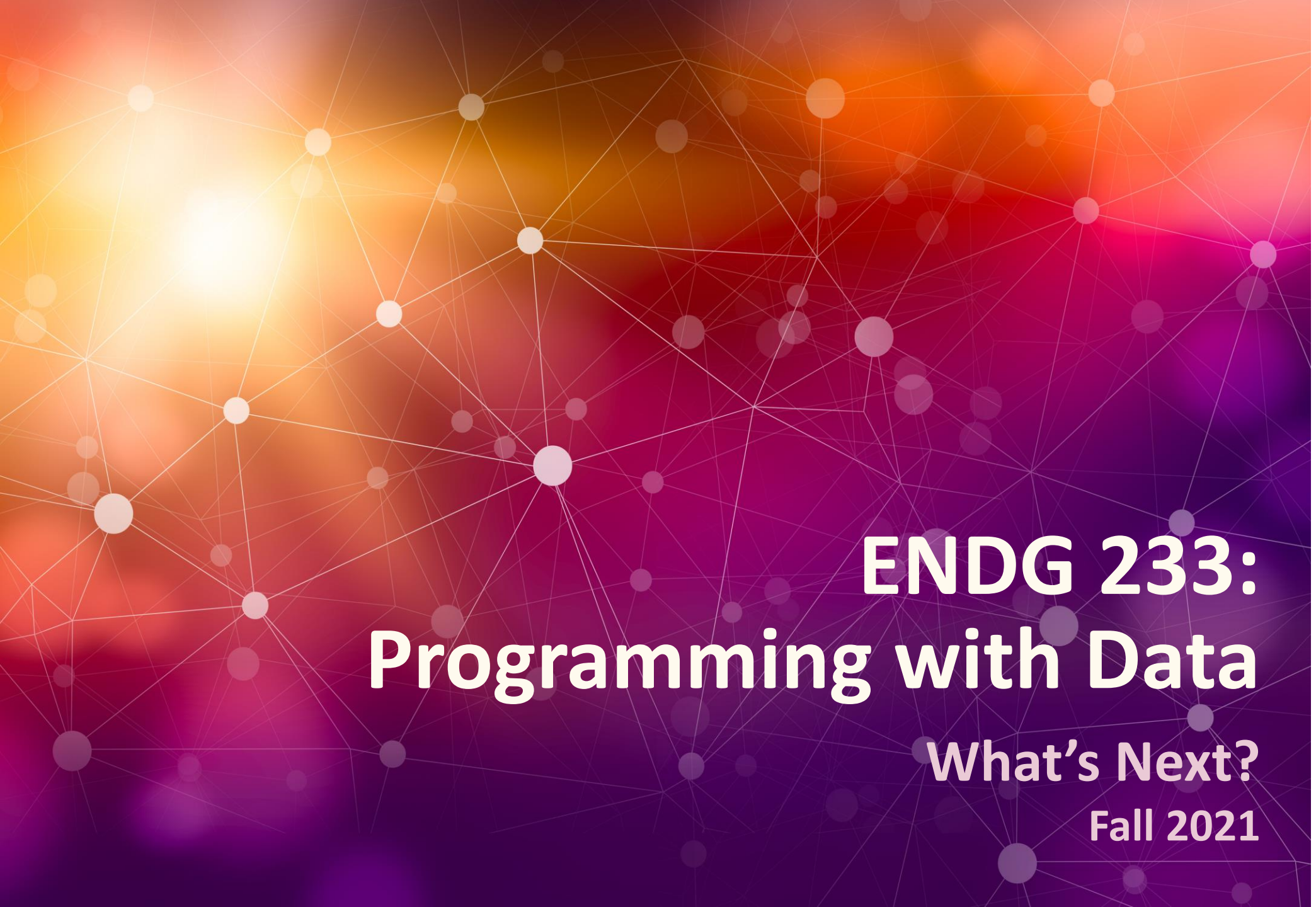


UNIVERSITY OF CALGARY

ENDG 233: Programming with Data

What's Next?

Fall 2021

ENDG 233 Concepts

UNIVERSITY OF CALGARY

- Algorithmic thinking and problem-solving
- Fundamental programming constructs
  - Variables, decision structures, control flow, etc.
  - Storing and computing data
- Applying coding to engineering problems
  - Input/output of data
  - Data visualization

ENDG 233 Learning Outcomes

UNIVERSITY OF CALGARY

- Solve algorithmic logic problems using flowcharts and pseudocode
- Develop simple computer programs using the foundational structures of a high-level computer language
- Apply coding techniques for data input, analysis, and output
- Read and write the basic syntax of the Python programming language
- Translate engineering problem specifications into software solutions

What's Next?

UNIVERSITY OF CALGARY

- Complex functions
- Designing algorithms
- Multi-dimensional data analysis and visualization
- Interacting with other platforms (databases, web, etc.)
- Team-based programming and repositories
- Integration of stats and probability
- More testing!

Make solar energy economical

Provide energy from fusion

Develop carbon sequestration methods

Manage the nitrogen cycle

Provide access to clean water

Restore and improve urban infrastructure

Advance health informatics

Engineer better medicines

Reverse-engineer the brain

Prevent nuclear terror

Secure cyberspace

Enhance virtual reality

Advance personalized learning

Engineer the tools of scientific discovery

GRAND CHALLENGES FOR ENGINEERING

National Academy of Engineering
http://www.engineeringchallenges.org/challenges.aspx

Role of Data in Machine Learning

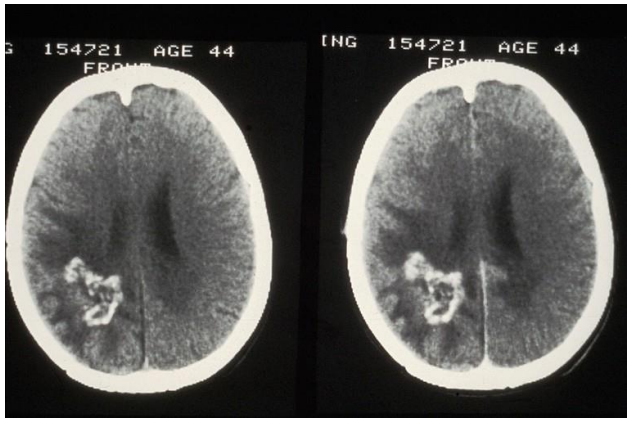
UNIVERSITY OF CALGARY

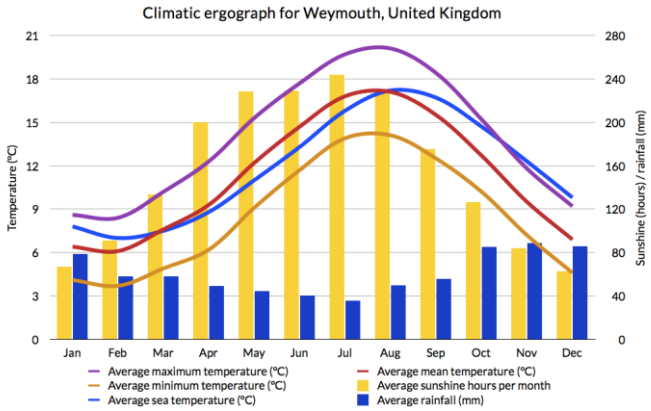
- Group data – classification, clustering, associations
- Analyze relationships between input and output variables
- Find patterns based on similarities
- Apply rules to make predictions

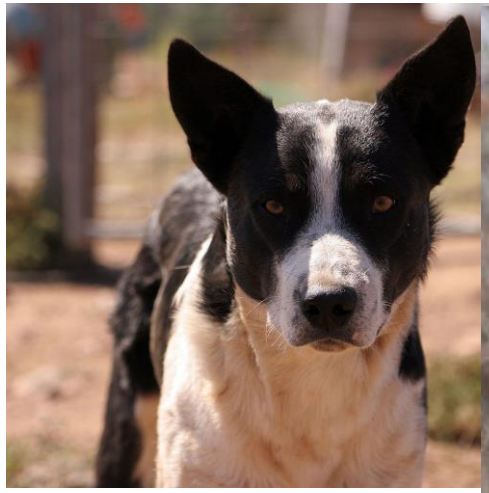


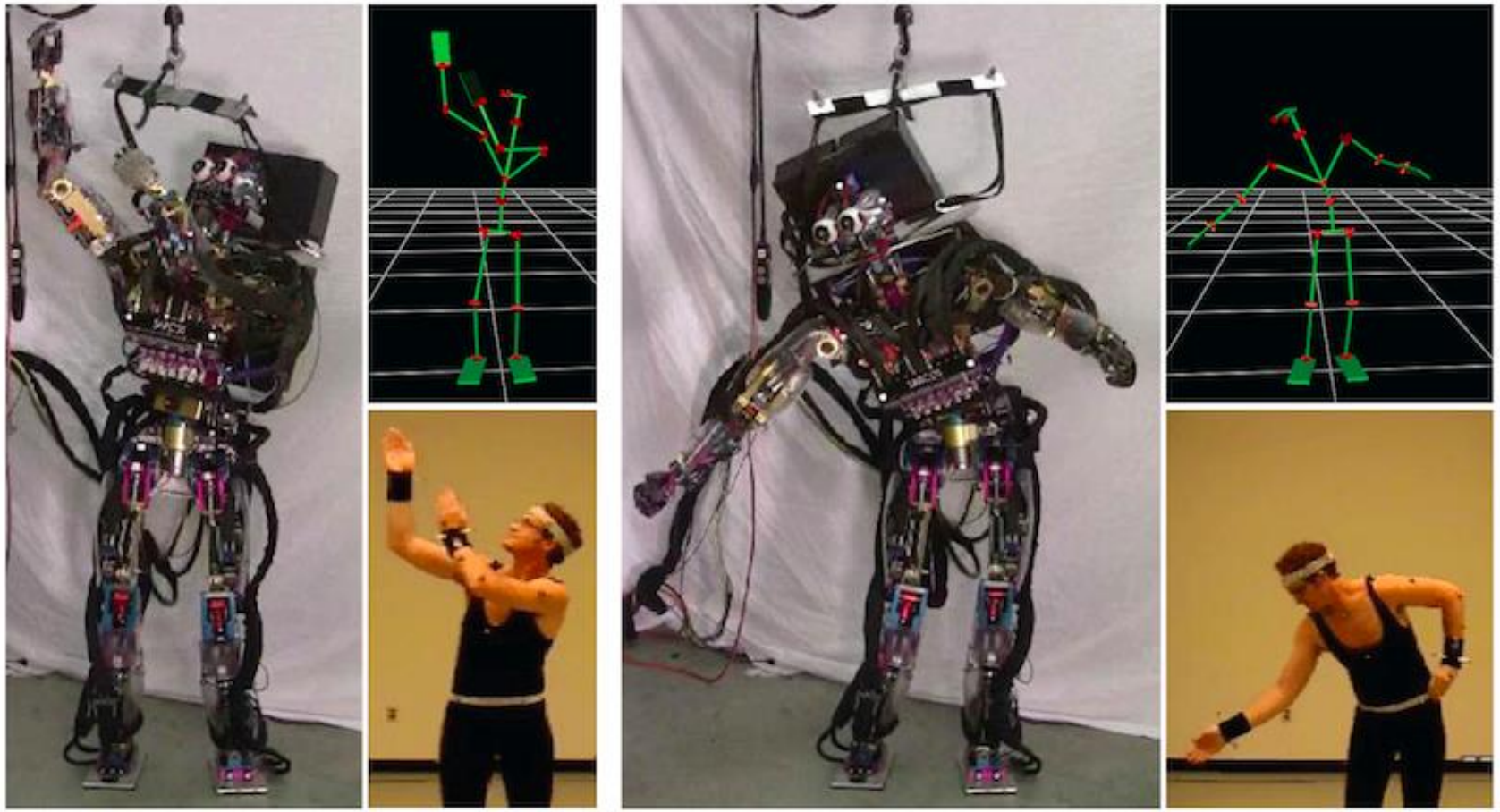

Example Application

- Marketing
- Speech analysis and vocabulary
- Medical diagnostics
- Business and real-estate trends
- Weather and climate predictions
- Adaptive education
- Intelligent automation (self-driving cars, etc.)

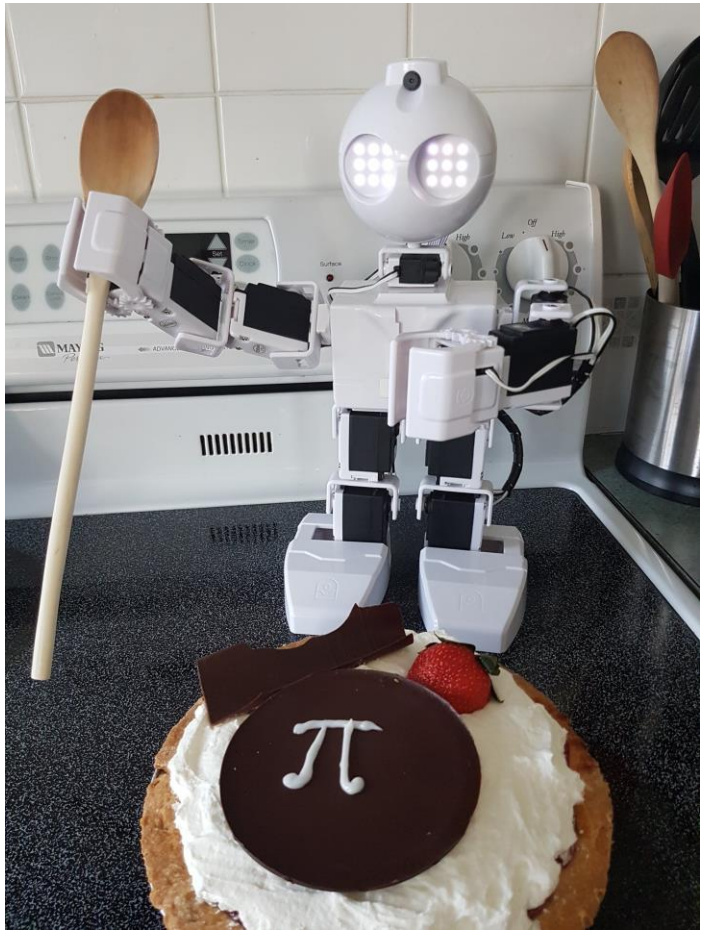




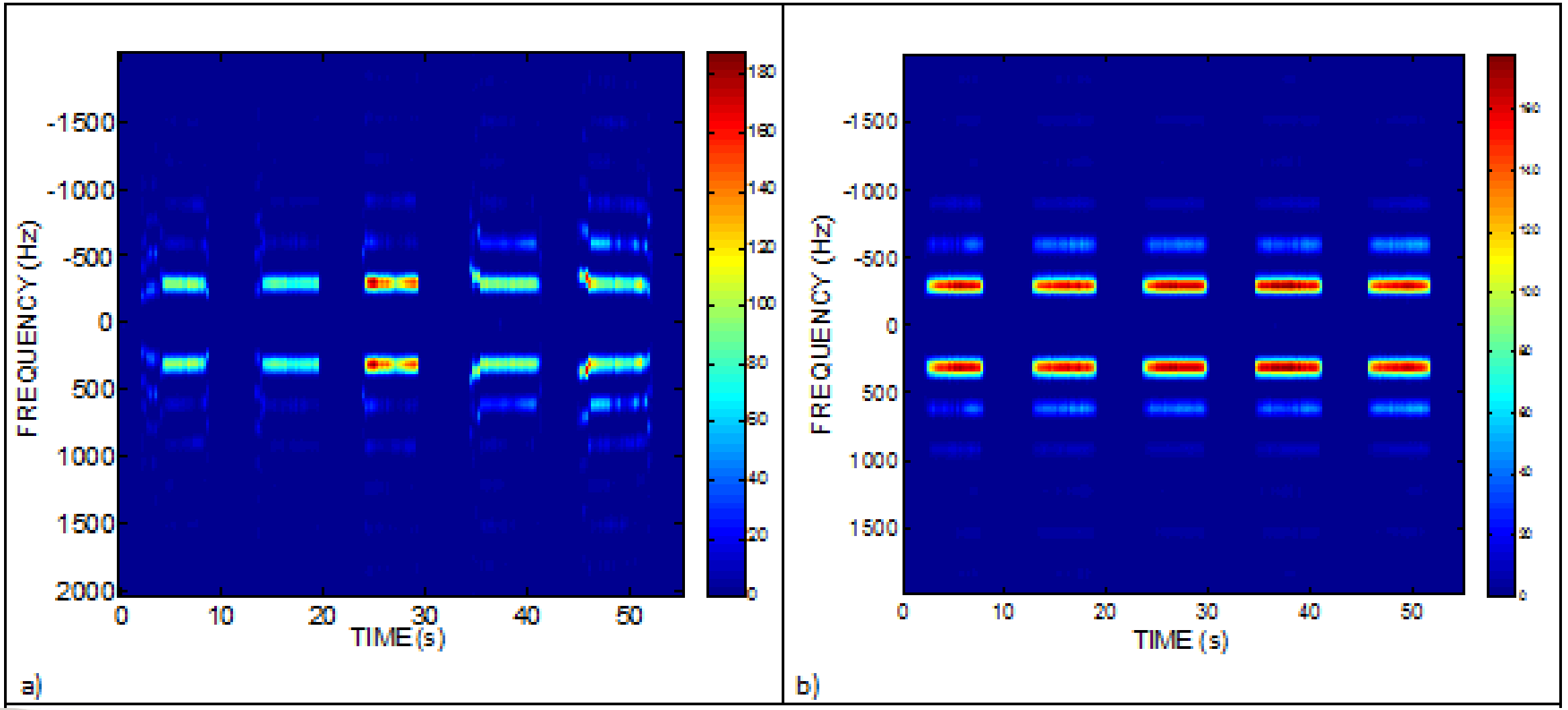




"Controlling Humanoid Robots with Motion Capture Data"
Credits: Disney Research



E. Marasco


FREQUENCY (Hz)
-1500
-1000
-500
0
500
1000
1500
2000
0
10
20
30
40
50
TIME (s)
a)
b)

E. Marasco

https://www.youtube.com/watch?v=uxVVgBAosqg

A “selfie” photo of NASA’s Curiosity rover on Oct. 11, 2019. Credits: NASA/JPL-Caltech/MSSS
https://www.nasa.gov/feature/jpl/new-selfie-shows-curiosity-the-mars-chemist

“Designing a solution that elegantly solves the problem and satisfies the constraints is one of the most creative activities I know.”

- Wm. A. Wulf, Past President of the National Academy of Engineering