

**Homework 2 - Coding**

Due: Thursday, January 27 – 10:00 am EST

**Problem 1C: Speed of LU factorizations [20 Points]**

1. Create a matrix  $A \in \mathbb{M}(3 \times 3, \mathbb{R})$  with random entries.
2. Use a Python library (e.g. `NumPy`) to compute the PLU-factorization  $A = PLU$ . Print  $P$ ,  $L$ ,  $U$ .
3. Write a function `LUtime` which accepts an integer  $n$  as input, creates a matrix  $M \in \mathbb{M}(n \times n, \mathbb{R})$  with random entries and returns the time that it takes to compute the PLU factorization of this matrix  $M$ .
4. Execute this function for  $n \in \{1, 2, \dots, 2000\}$  and plot `LUtime(n)`. This is a computationally heavy operation. On google colab it takes about 30 seconds to complete.
5. **Math 513:**  
Fit a cubic to this data and interpret the result (cf. problem 2T).