“Daily-Log of Internship at ZIB”

Utkarsh Sharma

22/5/23 - present

- **May 22, 2023**:
  - Started with Class on Prox methods and non-smooth convex optimization
  - Installed Julia locally and learnt its basic syntax
  - Submitted Homework exercises pertaining to Lecture-1
- **May 23, 2023**:
  - Read [1] sections 1 - 3
  - Went through class Lecture-2 and Lecture-3’s notes and completed their exercises
  - Read [2] pages 1-10, with special attention to the assumptions listed and Algorithm - 1
- **May 24, 2023**:
  - Went through Lecture 4’s notes and completed the exercises
  - Went through *Mert Pilanci (Stanford University) - Monotone Operators* to understand maximal monotone operators and related stuff overlapping with [2]
- **May 25, 2023**:
  - Read *S. Boyd, J. Duchi, M. Pilanci, and L. Vandenberghe - Subgradients* lecture notes to understand some properties of subgradients
  - Continued reading about [2] and tried to build an intuition towards Algorithm-2
  - Went through Lecture Notes 5 of Crash Course
  - Homework Exercises pertaining to today’s lecture
- **May 26, 2023**:
  - Watched *Gilbert Strang - Singular Value Decomposition* to learn about SVD and its mention in the class notes
  - Went through the notes of the last lecture
  - Homework Exercises for the last lecture
  - Installed Julia in the Z1 cluster of ZIB

- **May 30, 2023**:
  - Meeting with my Advisor wherein he explained the intuition of Algorithms in [3] and some other technical details.
  - Read and tried to understand the hierarchy of last year's project code for Algorithm-4 mentioned in [3]
  - Analysed different functions under AsyncProx/Comb18 Library
- **May 31, 2023**:
  - Collaborated with my project partner to go over last year's repository and find out missing elements, features and design decisions in it.
- **June 1, 2023**:
  - Wrote the default algorithm for choosing blocks I_n - in a cyclic manner. Also added the functions so that the user can choose any block-choosing strategy function of their own and use it in the code.
  - Ran the previous algorithm on a bunch of different settings to further understand its limitations and structure.
- **June 2, 2023**:
  - Discussed with my project partner what changes we should make in the current code to make it better.
  - Meet with Aryan Dua, where he explained Comb18 directory's code - what are its limitations, design decisions, reasons for the design choices made.
- **June 5, 2023**:
  - Studied @tasks in Julia (https://docs.julialang.org/en/v1/base/parallel/) to understand the syntax and rules for asynchronous programming in Julia.
  - Wrote the algorithm for the 'indices not inside block I_n' and added choosing a generic or specific block option in the code.
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References

[1] D. Drusvyatskiy, The proximal point method revisited (2017).

[2] P. R. Johnstone, J. Eckstein, Projective splitting with forward steps: Asynchronous and block-iterative operator splitting (Aug 2020). arXiv:1803.07043.
URL https://arxiv.org/abs/1803.07043v7

[3] J. E. Patrick L. Combettes, Asynchronous block-iterative primal-dual decomposition methods for monotone inclusions.
URL https://pcombet.math.ncsu.edu/mp2.pdf