CONTINUOUS INTEGRATION FOR OCR-D IN HPC

DevOps Strategies in HPC

By: Abdallah Abdelnaby
Supervisor: Giorgi Mamulashvili

Agenda

- Introduction
- Literature
- Project Objectives
- OCR-D
- Project Key Components and Structure
- Results
- Conclusion and Future Work

Inroduction

What is DevOps?

Collaborative culture and set of practices to improve software development and operations

- **Key Features:**
  - Continuous Integration/Continuous Delivery (CI/CD)
  - Infrastructure as Code (IaC)
  - Automation and Monitoring
- **Benefits**:
  - Faster development cycles
  - Improved collaboration
  - Increased reliability

Introduction

What is HPC?

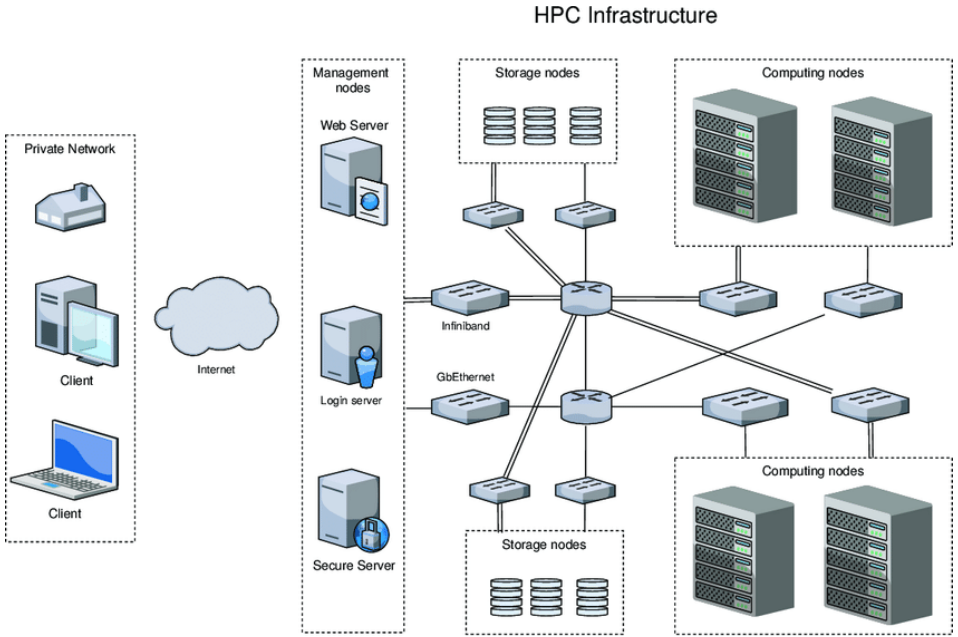

Figure 1: (2020) Timing Predictability in High-Performance Computing With Probabilistic Real-Time

Literature

- Virtualization and Containers
- Git Repositories
- CI/CD Engines
- Integration Examples:
  - Centralized Pipelines
  - Decentralized Pipelines

(2023) Leveraging DevOps for Scientific Computing

Virtualization and Containers

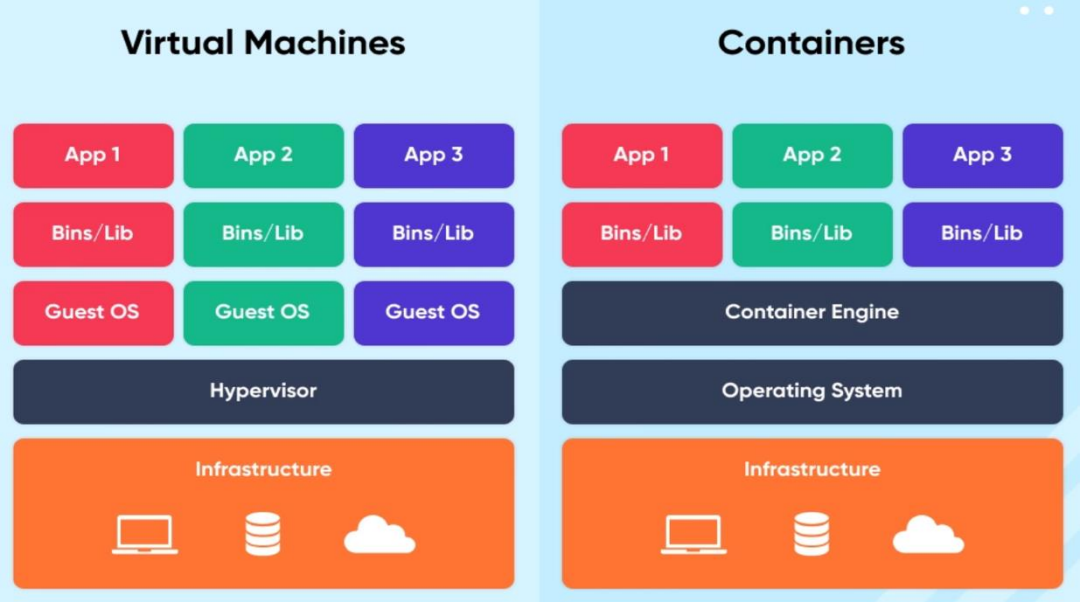

Figure 2: (2023) Net Solutions

Git Repositories

- Version control for code and documentation
- History tracking and collaboration
- Simplifies code synchronization
- Enables cryptographically secure attestations (RFC3161/RFC5816)

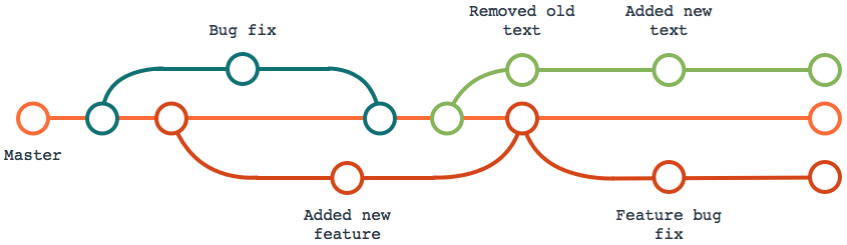

Figure 3: (2018) CPanel

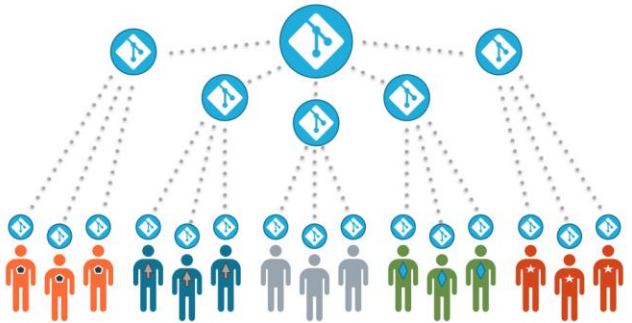

Figure 4: (2018) CPanel

CI/CD Engines

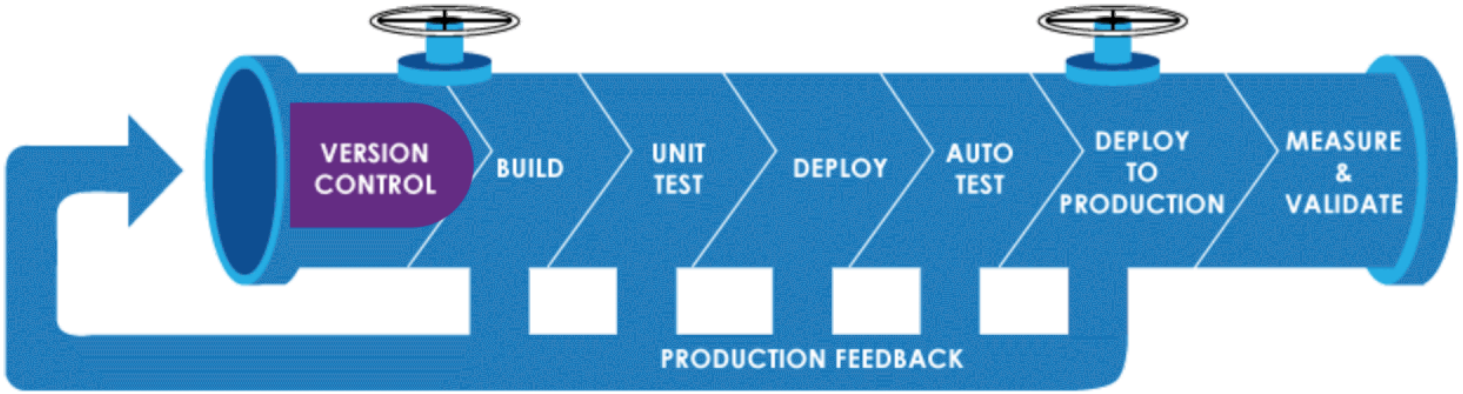

Figure 5: (2023) LinkedIn

Integration Examples

Centralized Pipeline

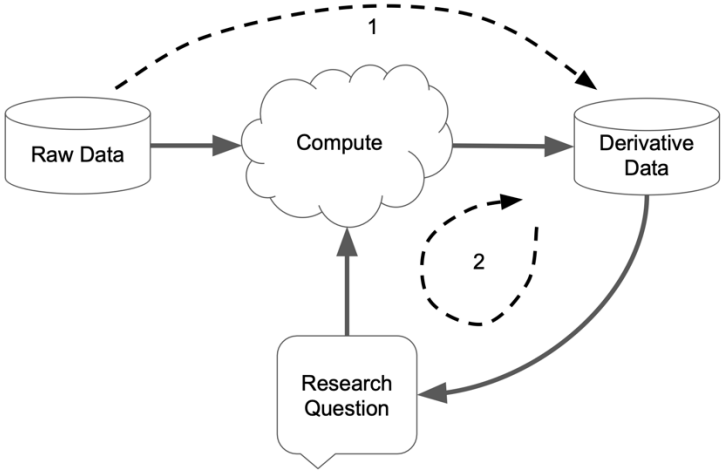

Figure 6: (2023) Leveraging DevOps for Scientific Computing

Decentralized Pipeline

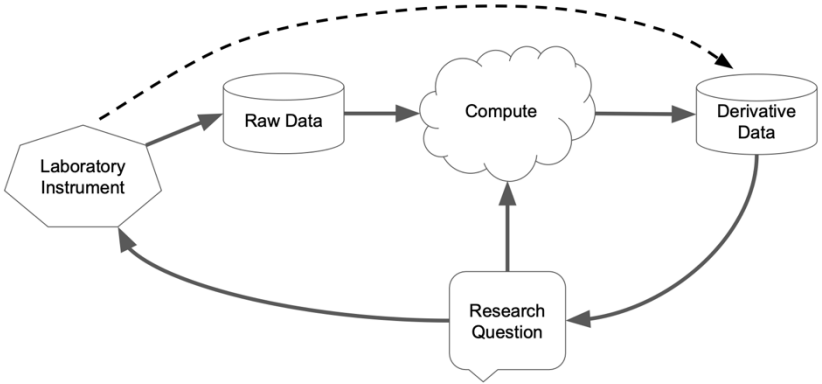

Figure 7: (2023) Leveraging DevOps for Scientific Computing

Project Objectives

- Provide a continuous integration for OCR-D in HPC
- Be able to run OCR-D workflows on HPC through the CI/CD Pipeline

But,
What is OCR-D? and what are the OCR-D workflows?!

OCR-D

- DFG-Funded Initiative for Optical Character Recognition Development
- https://ocr-d.de/

- Mainly used to make digital copies for old documents and manuscripts

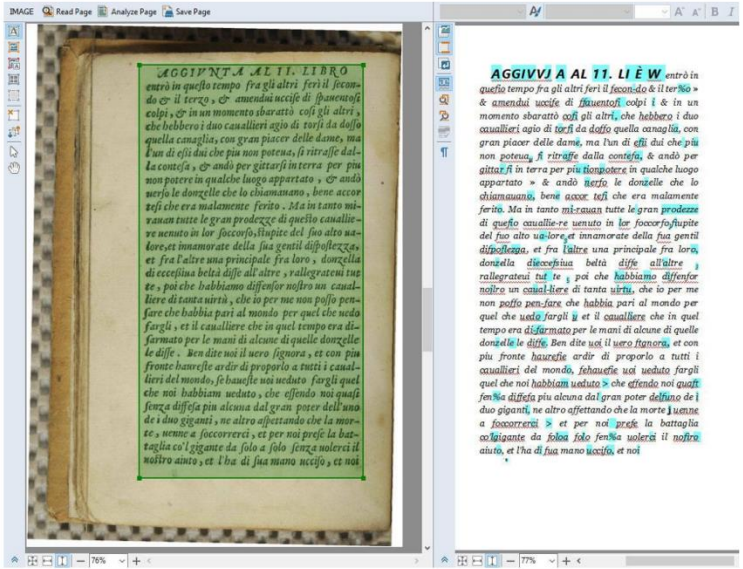

Figure 8: (2016). Early printed edition and OCR techniques

OCR-D Processors and Workflows

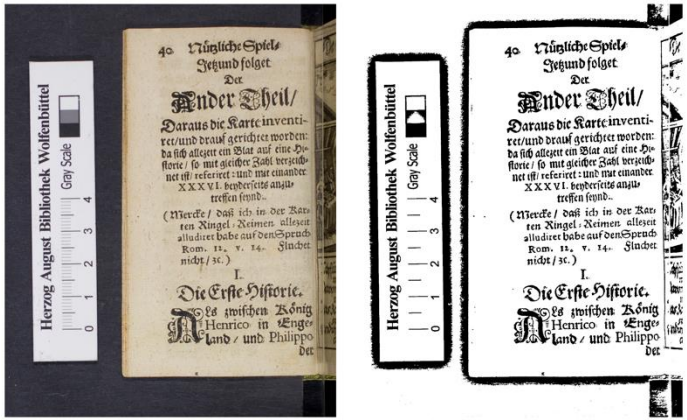

Figure 9: OCR-D Binarization

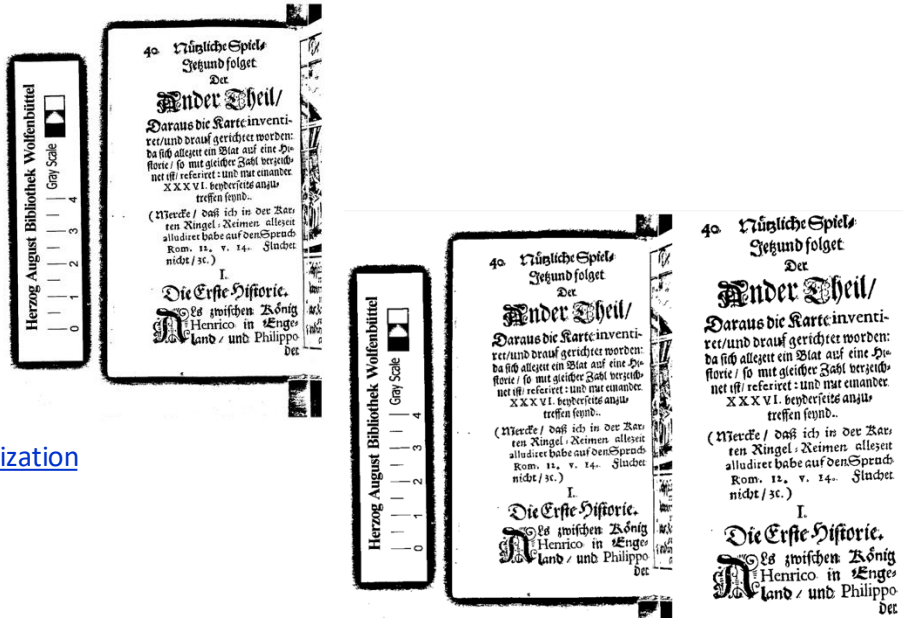

Figure 10: OCR-D Cropping

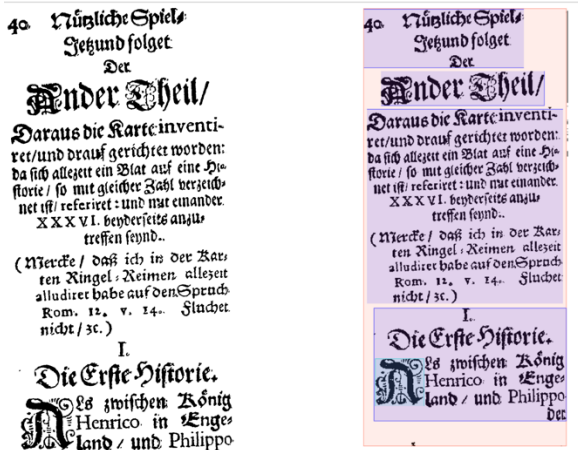

Figure 11: OCR-D Region Segmentation

Key Components

- GWDG HPC
- Containerization System
  - Singularity
- Git Repositories
  - Gitlab
- CI/CD Pipeline
- GitLab Runner

Project Structure

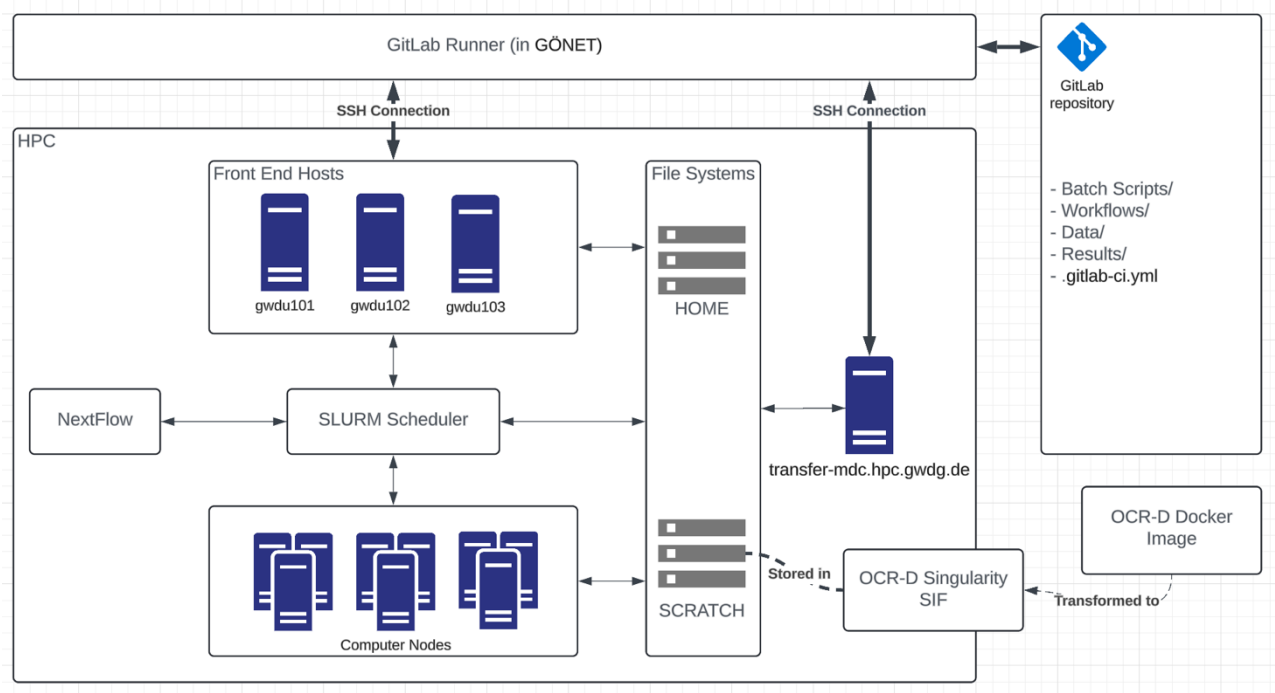

Figure 12

CI/CD Pipeline Stages

1. Connect to HPC (on any tag)
2. Upload data, workflow, the batch scripts to HPC (on any tag)
3. Pull OCR-D Docker image and Create a Singularity SIF (on build tag)
4. Download OCR-D Models (needs ”3”)
5. Submit the OCR Job (on {workflow_name} tag)
6. Retrieve the results to repo/ when available (needs “3”)
7. Cleanup ➔delete the work from SCRATCH or move it to HOME and disconnect (needs “4”)

Results

- Page XML (Harldy Readable)
- Solution: LAREX

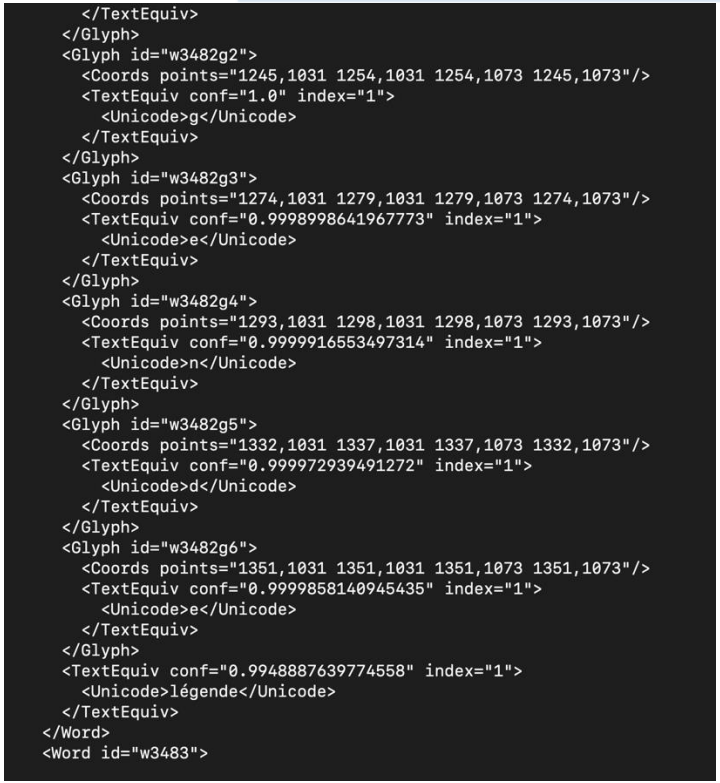

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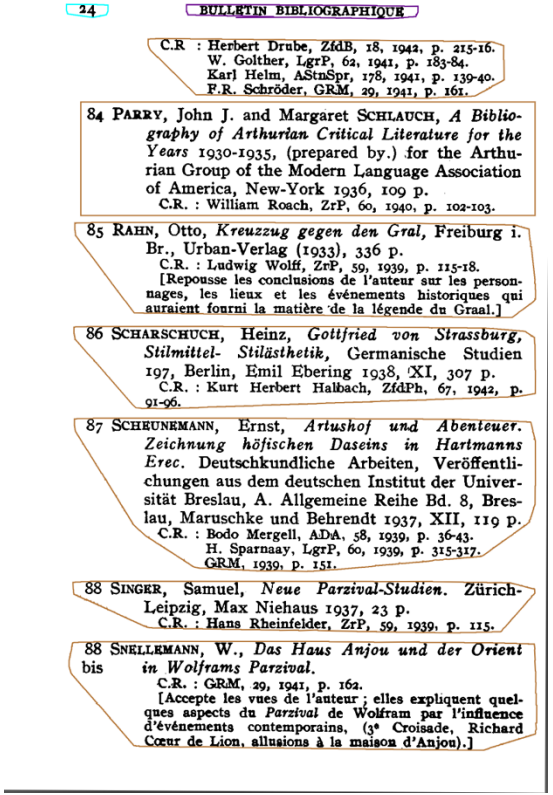
Figure 13

Results

Segmentation Results



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[Accepte les vues de l'auteur ; elles expliquent quelques aspects du *Parzival* de Wolfram par l'influence d'événements contemporains, (3e Croisade, Richard Cœur de Lion, allusions à la maison d'Anjou).]

Figure 14

Results

Line Detection Results

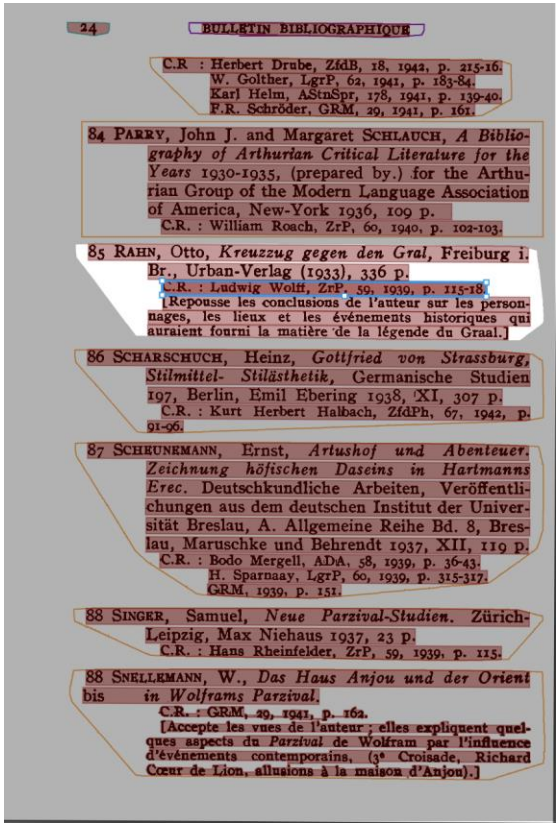

Figure 15

Results

Text Recognition Results

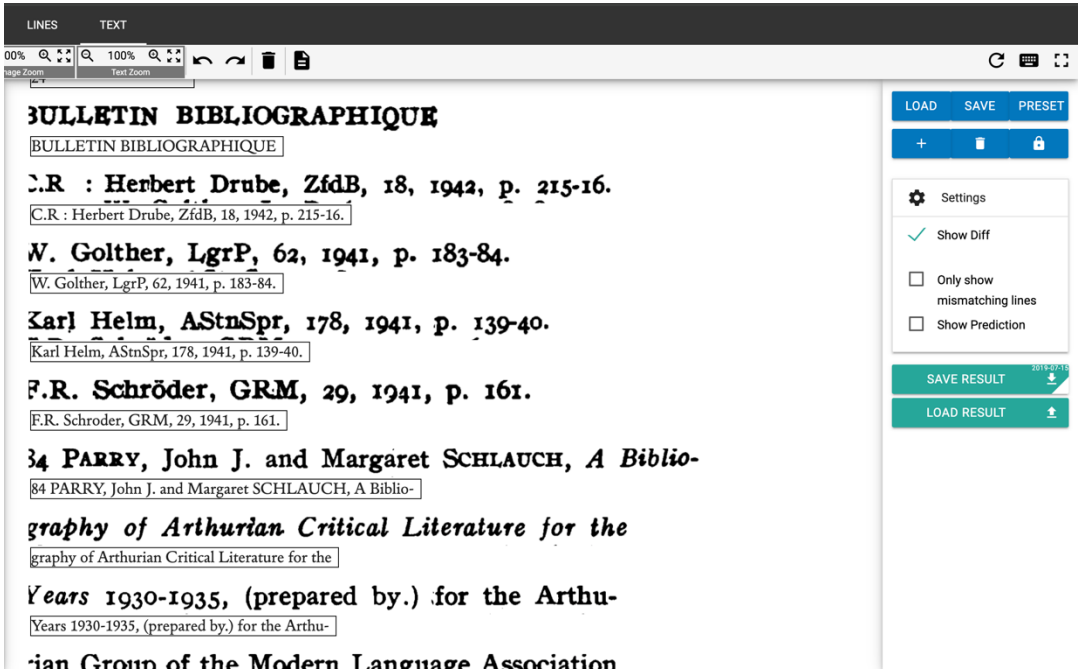

Figure 16

Results

Processing speed

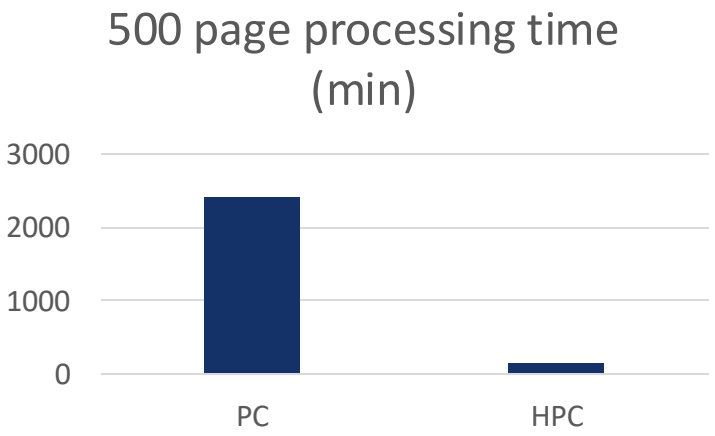

Figure 17

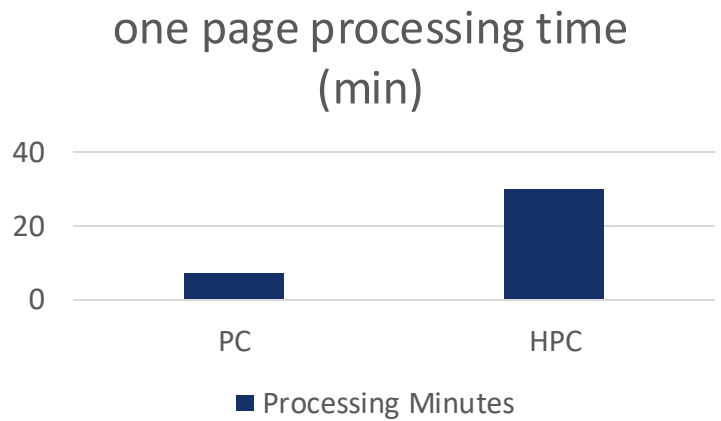

Figure 18

Conclusion and Future Work

- Use the GWDG proxy server
- Optimize the project to run parallel pipelines
- Deploy LAREX on a server and upload the results directly to LAREX

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