Object Detection

CS 4624: Multimedia, Hypertext, and Information Access
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Dataset Creation, Main Contact	Dataset Creation, Documentation	Pipeline Model development	Dataset Creation, Documentation	Assistating Pipeline Development, Evaluation

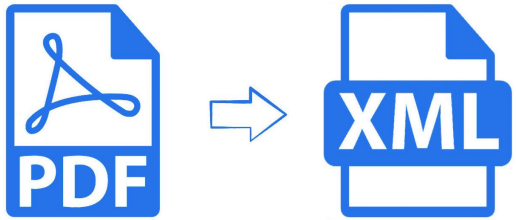
Client: Aman Ahuja

Outline

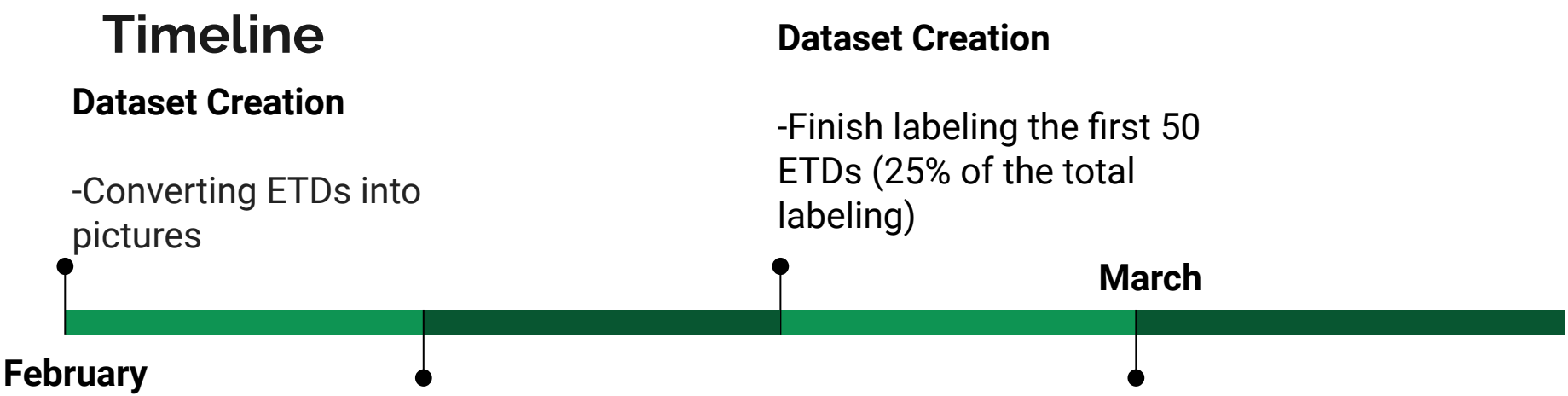
- Objectives Recap
- TimeLine
- Dataset
- Pipeline
- Current Results
- OCR
- XML & Visualization
- Acknowledgements

Objectives Recap

- Annotate dataset of 150 - 200 ETDs
  - ETDs: Electronic Theses and Dissertations
  - Scanned ETDs (older papers)
  - Digital / Electronic ETDs (embedded text)
- Train / develop model that converts ETDs into machine readable format
- Visualize results



Timeline


Dataset Creation
-Converting ETDs into pictures
February
Modeling
-Set up the Detectron2 model pretrained on Docbank dataset.
Dataset Creation
-Finish labeling the first 50 ETDs (25% of the total labeling)
March
Modeling
-Preliminary Training

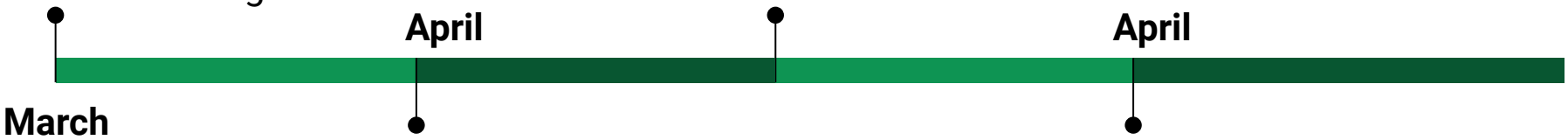
Timeline

Dataset Creation

-Complete 50% of the total labeling work

Dataset Creation

-Complete all the labeling work and review the previous labeling



Modeling

-Retrain Model with more data

-Finish images to text function (OCR)

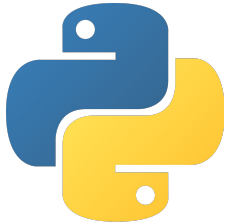
Modeling

-Finalize the pipeline

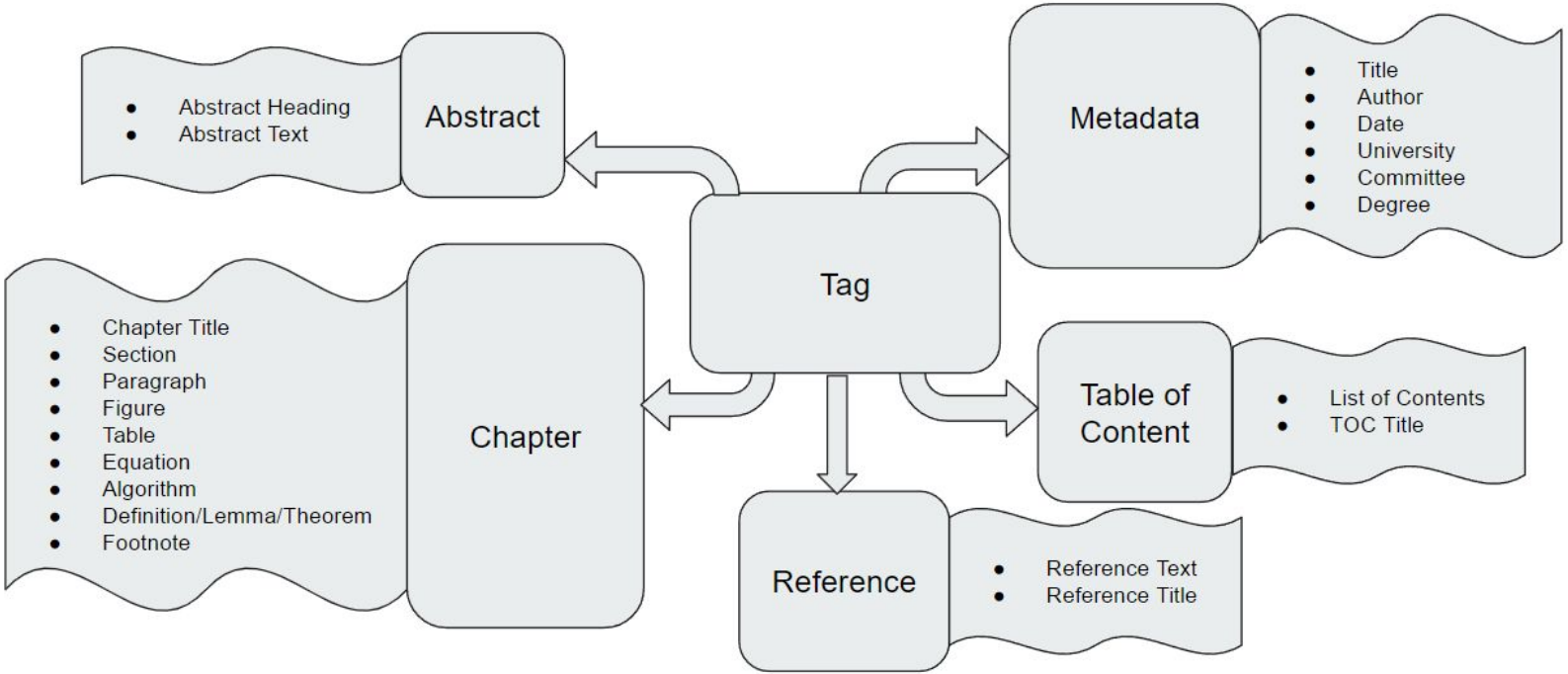
-Retrain the model

Completed Work

- Annotated 100 scanned and 100 digital ETDs
- Trained 3 models on 10k iterations for scanned, digital, and merged (both scanned and digital)
- Developed text extraction script
- Developed visualization script
- Evaluated and reported results to the client



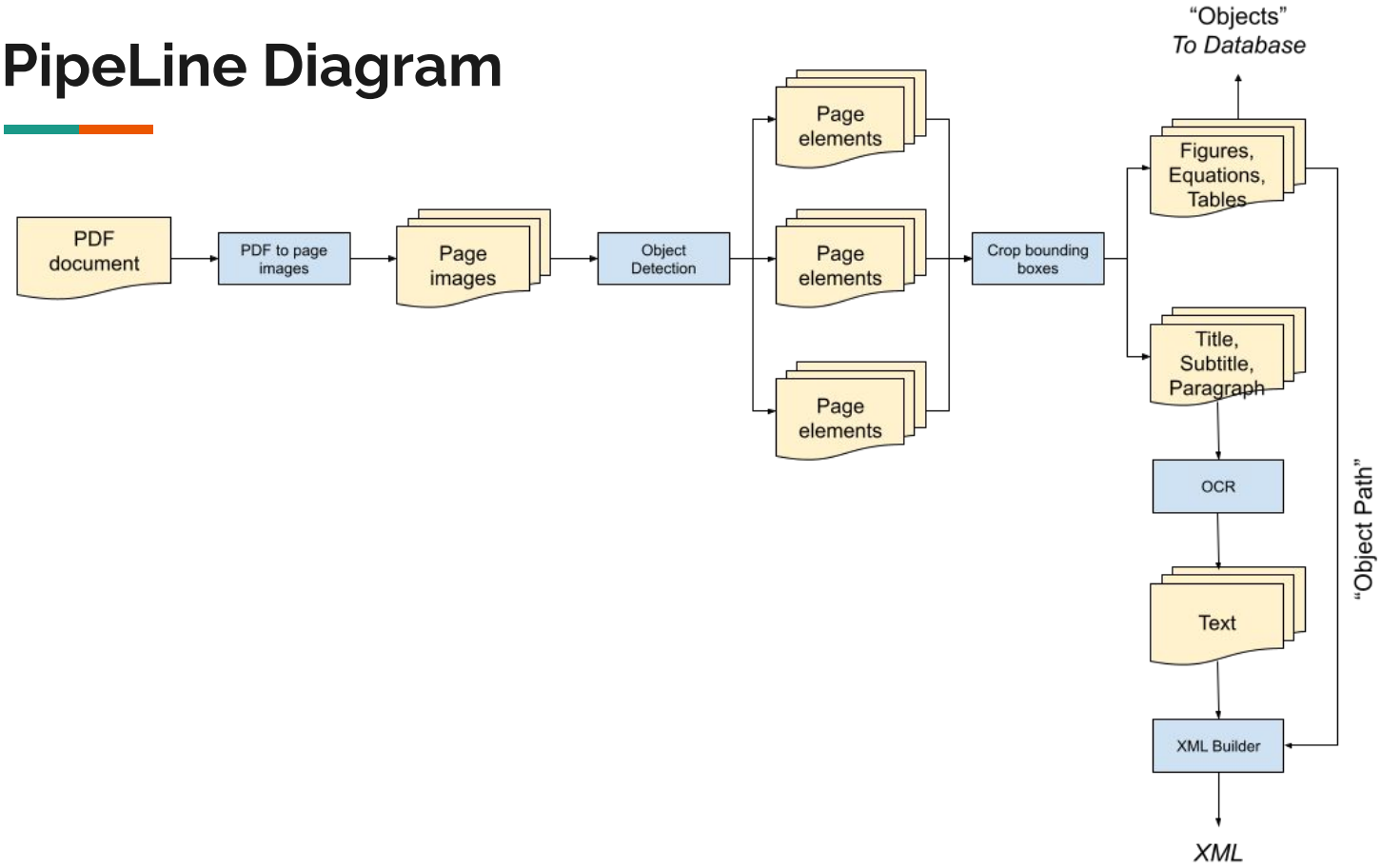
ETDs


Abstract Heading
Abstract Text
Abstract
Metadata
Title
Author
Date
University
Committee
Degree
Tag
Chapter Title
Section
Paragraph
Figure
Table
Equation
Algorithm
Definition/Lemma/Theorem
Footnote
Chapter
Table of Content
List of Contents
TOC Title
Reference
Reference Text
Reference Title

Preprocessing

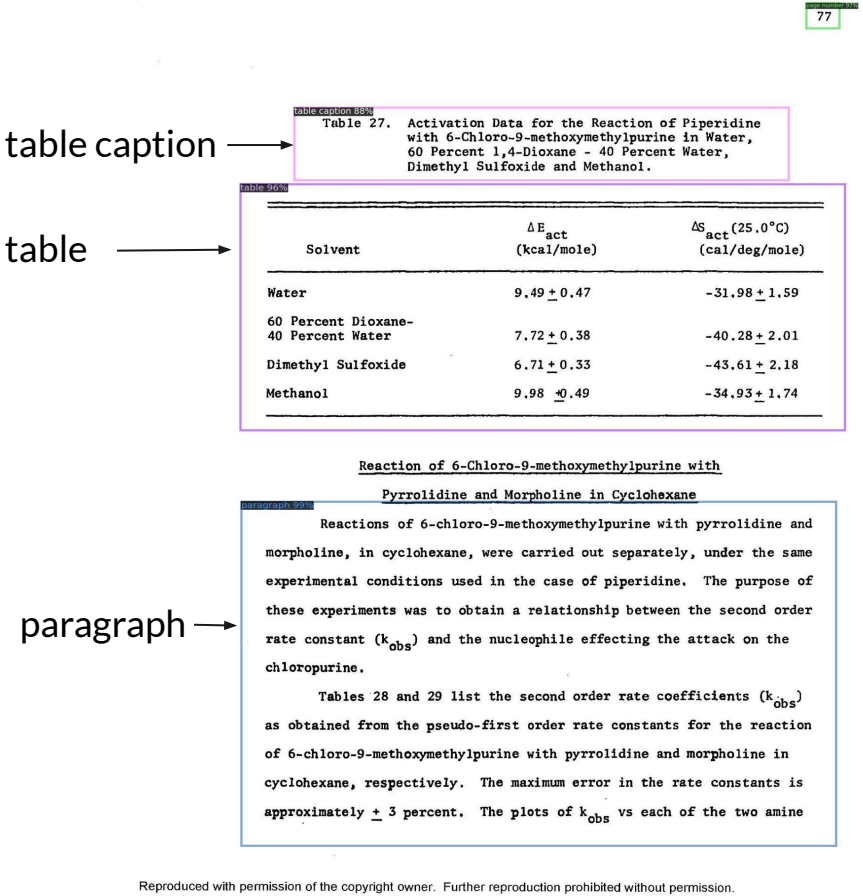
- Rules For Labeling
  - Tables that are not part of the Table of Contents are labeled as Table
    - Only the Table of Contents can be labeled Table of Contents
  - Appendix is labeled as Chapter
    - Can be identified by Chapter title
  - Subsections of One-chapter ETDs are labeled as Chapter titles
  - Subsections of Multi-chapter ETDs are labeled as Section

PipeLine Diagram



Object Detection Model

- Detectron2
  - Neural network (*Base - RCNN- FPN Model*)
- Evaluation
  - COCO evaluator (Common Objects in Context)
- Train environment
  - CUDA-enabled server (runs on private GPU)



Evaluated Metrics

- Average Precision (AP):
  - AP - Percentage AP at IoU = 0.50:0.05:0.95 (primary challenge metric)
  - AP50 - Percentage AP at IoU = 0.50 (PASCAL VOC metric)
  - AP75 - Percentage AP at IoU = 0.75 (strict metric)
- AP Across Scales:
  - APs - Percentage AP for small objects: area < 32^2
  - APm - Percentage AP for medium objects: 32^2 < area < 96^2
  - APl - Percentage AP for large objects: area > 96^2

Results with Scanned ETDs

Table 4: Results for Model Trained on 50 Scanned ETDs

AP	AP50	AP75	APs	APm	APl
24.650	42.153	23.972	8.727	17.206	24.668

id	AP	id	AP	id	AP
chapter-title	21.479	equation	47.795	paragraph	64.080
chapter-subheading	19.727	equation-number	25.815	reference-heading	0.000
degree	0.000	figure	62.250	reference-text	76.897
title	0.000	figure-caption	39.812	supervisor	nan
abstract-heading	0.000	foot-note	60.158	table	69.630
abstract-text	0.000	list-of-content-heading	0.000	table-caption	27.985
author	0.000	list-of-content-text	0.000	university	0.000
date	0.000	page-number	26.680		

Table 7: Results for Model Trained on 50 Scanned ETDs w/ RF Sampling

AP	AP50	AP75	APs	APm	APl
24.271	42.516	24.342	8.591	17.924	24.318

id	AP	id	AP	id	AP
chapter-title	21.318	equation	42.729	paragraph	67.561
chapter-subheading	14.374	equation-number	24.503	reference-heading	0.000
degree	0.000	figure	62.643	reference-text	64.978
title	0.000	figure-caption	42.014	supervisor	nan
abstract-heading	0.000	foot-note	58.881	table	59.509
abstract-text	0.000	list-of-content-heading	0.000	table-caption	36.164
author	0.000	list-of-content-text	9.901	university	0.000
date	0.000	page-number	26.032		

- AP ~ 24
- Repeat Factor Sampling
  - Model weakened
  - Captions improved
  - Found list-of-content-text
- 2nd Strongest Model

Results with Digital ETDs

Table 5: Results for Model Trained on 50 Digital ETDs

AP	AP50	AP75	APs	APm	APl
28.156	48.292	26.993	16.719	22.563	40.958

id	AP	id	AP	id	AP
chapter-title	13.179	date	16.238	list-of-content-text	66.729
chapter-subheading	29.576	degree	0.000	page-number	21.300
title	0.000	equation	48.631	paragraph	74.533
abstract-heading	0.000	equation-number	21.645	reference-heading	16.365
abstract-text	0.000	figure	73.803	reference-text	80.223
algorithm	0.000	figure-caption	42.484	table	53.465
author	5.406	foot-note	60.387	table-caption	39.252
committee	0.000	list-of-content-heading	12.525	university	0.000

Table 8: Results for Model Trained on 50 Digital ETDs w/ RF Sampling

AP	AP50	AP75	APs	APm	APl
27.910	49.091	27.576	14.563	22.905	39.634

id	AP	id	AP	id	AP
chapter-title	13.440	date	10.495	list-of-content-text	59.982
chapter-subheading	30.032	degree	0.000	page-number	21.206
title	0.000	equation	48.243	paragraph	72.445
abstract-heading	0.000	equation-number	21.515	reference-heading	10.461
abstract-text	0.000	figure	69.651	reference-text	83.272
algorithm	0.000	figure-caption	42.948	table	61.366
author	8.581	foot-note	58.569	table-caption	42.702
committee	0.000	list-of-content-heading	14.930	university	0.000

- AP ~ 28
- Repeat Factor Sampling
  - Model weakened
  - Captions improved
- Strongest Model

Results With Merged ETDs

Table 6: Results for Model Trained on 100 Merged ETDs

AP	AP50	AP75	APs	APm	APl
21.727	38.328	21.255	15.147	15.765	21.649

id	AP	id	AP	id	AP
chapter-title	18.568	degree	0.000	paragraph	70.653
chapter-subheading	22.432	equation	39.679	reference-heading	0.000
title	0.000	equation-number	20.444	reference-text	63.894
abstract-heading	0.000	figure	65.616	supervisor	nan
abstract-text	0.000	figure-caption	41.944	table	67.552
algorithm	0.000	foot-note	51.508	table-caption	34.425
author	0.000	list-of-content-heading	0.000	university	0.000
committee	0.000	list-of-content-text	0.000		
date	1.188	page-number	23.538		

Table 9: Results for Model Trained on 100 Merged ETDs w/ RF Sampling

AP	AP50	AP75	APs	APm	APl
22.383	38.876	21.867	10.026	15.186	22.316

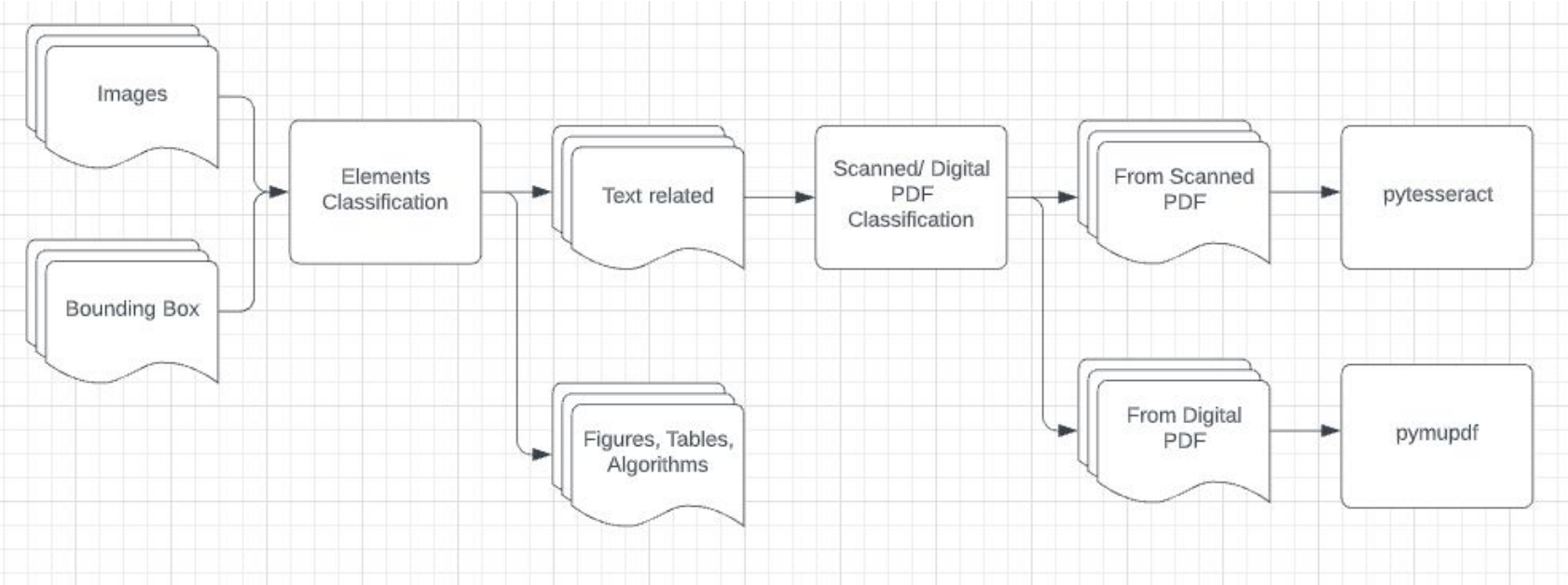
id	AP	id	AP	id	AP
chapter-title	16.366	degree	0.000	paragraph	69.413
chapter-subheading	24.229	equation	43.083	reference-heading	2.376
title	0.000	equation-number	17.197	reference-text	81.635
abstract-heading	0.000	figure	65.005	supervisor	nan
abstract-text	0.000	figure-caption	39.481	table	61.285
algorithm	0.000	foot-note	58.096	table-caption	33.356
author	2.030	list-of-content-heading	0.000	university	0.000
committee	0.000	list-of-content-text	0.000		
date	0.000	page-number	23.648		

- AP ~ 22
- Repeat Factor Sampling
  - Model improved
  - Captions weakened
  - Found author
  - Lost date
- Weakest Model

Results Takeaways

- Repeat Factor (RF) Sampling is a tool to address dataset label distribution imbalance
  - i.e., many instances of “paragraph”, one instance of “title”
  - Used because it is difficult to predict sparse elements
- 3 models trained with and without RF Sampling
  - Digital ETDs are easiest to predict
  - Merged ETDs are the most difficult
  - RF Sampling caused minor changes to results
    - Some good, some bad, inconsistent at this point
    - Expected to be a valuable tool given more data

OCR (Optical Character Recognition)



Generated XML

- Front
  - Metadata: Title, author, etc.
- Body
  - List of chapters
    - Paragraphs
    - Figures
    - Tables
    - Subheadings
    - Algorithms
- Back
  - References

```
<etd>
    <front>
        <title> ETD Title </title>
        ...
    </front>
    <body>
        <chapter>
            ...
            <chapter_subheading>
            ...
            </chapter_subheading>
            <paragraphs>
            ...
            <paragraphs>
            ...
        </chapter>
        ...
    </body>
    <back>
        <reference_heading></reference_heading>
        <reference_text></reference_text>
    </back>
</etd>
```

Visualization in HTML

Association of Working Alliance and Parenting Stress for Mothers of Toddlers At-Risk for Autism Spectrum Disorder

Association of Working Alliance and Parenting Stress for Mothers of Toddlers At-Risk for Autism Spectrum Disorder

Vattuone, Cristiana

UCLA

for the degree Master of Arts in Education

committee Not found

2013

ABSTRACT OF THESIS Association of Working Alliance and Parenting Stress for Mothers of Toddlers At-Risk for Autism Spectrum Disorder

Introduction: Parents of children with autism spectrum disorder (ASD) consistently report elevated levels of parenting stress. The complexities associated with raising a child with ASD put parents at greater risk, highlighting the importance of understanding potential stressors and protective factors that impact parental wellbeing. As the prevalence of ASD continues to increase, children are being screened and identified at earlier ages. Still, little is understood about parents of children at-risk and the factors associated with parenting stress within this population. The purpose of this study was to examine stress profiles for parents of very young children at-risk, and to examine the working relationship or alliance between parents and early interventionists providing a research based intervention program.

TABLE OF CONTENTS

Chapter title not detected

Methods: This study utilized a working alliance framework to examine the association of alliance on lowering parental stress levels over the course of a 12-week parent mediated early intervention project. 66 toddlers at risk for autism were randomized into 12 sessions of a parent-mediated intervention group or 4 sessions of a parent education group. 45 of the 66 participants were included in the current sample. Parenting stress was measured at two time points pre and post treatment, and working alliance was measured post treatment. Results: Findings suggest that the caregivers in this study who participated in a parent-mediated intervention for their toddler at-risk reported on average clinical levels of parenting stress, as has been reported by parents of older children with ASD. Findings also showed that caregivers who participated in a parent-mediated treatment condition demonstrated higher alliance than the monitoring group. Alliance was marginally associated with lower parenting stress at the end of treatment. Conclusion: Future studies should examine alliance and parenting stress in larger samples as alliance could be an important factor in lowering parenting stress for families of at risk toddlers who are engaged in early intervention.

Introduction Parenting a child with a developmental disability can present its challenges, and families of children with autism spectrum disorder (ASD) may be particularly vulnerable. Parents of children with ASD consistently report higher levels of stress compared to parents of children with other developmental disabilities, such as Down syndrome and fragile x syndrome. These parents are also more likely to experience psychological symptoms of depression and anxiety (Baker-Ericzen, Brookman-Frazee, & Stahmer, 2005; Bebko, Konstantareas & Springer, 1987). The complexities associated with raising a child with ASD put parents at greater risk, which highlight the importance of understanding potential stressors that impact parental wellbeing. While parenting stress is well documented among parents of children formally diagnosed with ASD, little is understood about families whose children are at-risk or newly diagnosed. The prevalence of ASD is now reported in 1 in every 88 children (CDC, 2012) in the United States, and with recent advancements in early screening and diagnostic measures, children are being diagnosed at much younger ages than previously possible. As a result, further inquiry into the potential stressors experienced among this group of parents is essential. Thus, the aim of this study is to examine stress profiles of parents of younger children at-risk, as well as the association of parenting stress and working alliance between caregivers and early intervention providers. Given the paucity of research on family wellbeing and young children at-risk, this study aims to broaden our understanding of parenting stress to a much younger age group of children at-risk.

Autism Spectrum Disorder is a neurodevelopmental disorder that affects cognitive, social, and behavioral functioning. ASD now encompasses related disorders, including autism, Asperger's syndrome, and pervasive developmental disorder-not otherwise specified (PDD-NOS). Although autism symptoms are highly variable, there are unifying characteristics among children on the spectrum that include difficulties with social relatedness, communication, changes in routines, and repetitive behaviors. Onset of ASD symptoms must be present before 3 years of age, and formal diagnosis is possible using the following diagnostic framework: criteria from the Diagnostic and Statistical manual of the American Psychiatry Association (DSM-IV), algorithm scores from the Autism Diagnostic Observation Schedule (ADOS) (Lord, 2000), parent interviews, and medical history records. The ADOS is a standardized, semi-structured assessment and is considered the 'gold standard' in

Acknowledgements

Aman Ahuja

Professor Edward A. Fox

References

1. Roboflow Logo
2. Detectron2
3. PyTorch
4. Python Logo
5. DocBank Repo
6. DocBank Essay