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BOSTON UNIVERSITY

COLLEGE OF ENGINEERING

Dissertation

A BU THESIS LATEX TEMPLATE

by

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Submitted in partial fulfillment of the

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Facilis descensus Averni;
Noctes atque dies patet atri janua Ditis;
Sed revocare gradum, superasque evadere ad auras,
Hoc opus, hic labor est. *Virgil (from Don's thesis!)*

Acknowledgments

Here go all your acknowledgments. You know, your advisor, funding agency, lab mates, etc., and of course your family.

As for me, I would like to thank Jonathan Polimeni for cleaning up old LaTeX style files and templates so that Engineering students would not have to suffer typesetting dissertations in MS Word. Also, I would like to thank IDS/ISS group (ECE) and CV/CNS lab graduates for their contributions and tweaks to this scheme over the years (after many frustrations when preparing their final document for BU library). In particular, I would like to thank Limor Martin who has helped with the transition to PDF-only dissertation format (no more printing hardcopies – hooray !!!)

The stylistic and aesthetic conventions implemented in this LaTeX thesis/dissertation format would not have been possible without the help from Brendan McDermot of Mugar library and Martha Wellman of CAS.

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A BU THESIS LATEX TEMPLATE

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ABSTRACT

Have you ever wondered why this is called an abstract*? Weird thing is that its legal to cite the abstract of a dissertation alone, apart from the rest of the manuscript.*

Contents

List of Tables

List of Figures

List of Abbreviations

The list below must be in alphabetical order as per BU library instructions or it will be returned to you for re-ordering.

CAD	.....	*Computer-Aided Design*
CO	.....	*Cytochrome Oxidase*
DOG	.....	*Difference Of Gaussian (distributions)*
FWHM	.....	*Full-Width at Half Maximum*
LGN	.....	*Lateral Geniculate Nucleus*
ODC	.....	*Ocular Dominance Column*
PDF	.....	*Probability Distribution Function*
$\mathbb{R}^2$	.....	*the Real plane*

Chapter 1

Introduction

1.1 A few remarks before you start

Please read the short pointers below and on the subsequent pages; this will help you avoid frustrations when submitting the final dissertation to the library.

Your thesis should have 1.5in left and top margins, and 1in right and bottom margins. Getting this right is tricky since it may depend on your particular Latex installation. Most likely you will need to adjust some of the dimensions set up at the beginning of "bu_ece_thesis.sty" in this folder. Basically, every installation should have the base margin of 1in at the left and top, but this is not always the case. For example, the TexStudio/MiKTeX installation this document was set up on, has the default top margin of 0.3125in and so an additional margin of 0.6875in was added via \topmargin. In order to adjust these dimensions, you may want to follow these steps:

- *compile the document into PDF,*
- *open the document in Acroread, set it to full-page viewing and magnification to 100%*
- *navigate to a "full" page with the text extending from the very top to the very bottom and full-width left to right,*
- *measure the margins and adjust accordingly,*

- *if you are planning to print a hardcopy, you need to make sure to select "Page scaling" to "None" in Acrobat.*

Another issue that BU librarians may complain and you are likely to encounter are long URLs or other unbreakable text. In case of long URL addresses, you should use the URL package; please see suitable documentation on-line.

However, if you encounter a long unbreakable word (e.g., foreign) the URL package does not help. Have a look at the example extending into the page margin:

Consider the following Java-JDT plugin name in German: "'Plugin-Entwicklungsumgebung"'.

Clearly, this is a problem, and BU librarians will complain. One way of fixing this issue is to enclose the offending paragraph in `\begin{sloppypar}` *and* `\end{sloppypar}`*, resulting in the following outcome:*

Consider the following Java-JDT plugin name in German: "'Plugin-Entwicklungsumgebung"'.

Indeed, although the paragraph spacing becomes sloppy, at least you can hand in the thesis!

*LaTeX has a steep learning curve. You can use the original book by Lamport to learn more (***?***), but there are many on-line resources with excellent instructions and examples. Just Google a LaTeX topic you would like to explore.*

As far as editing and compilation of LaTeX sources, if you have not found one yet, TexStudio seems to be quite popular.We are still not certain about how the cost function J is structured. We are still not certain about how the cost function J is structured.

Chapter 2

Body of my thesis

2.1 SQL Query compiler

The steps involved are

2.1.1 Parsing

In a very general sense, given an SQL query, SQL converts it into a parse tree based on SQL grammar.

2.1.2 Preprocessing

This step has several functions.

If a "view" is used in the query as a relation, then each instance has to be replaced by the parse tree.

The preprocessor also has to conduct semantic checking, that is, check if relations used exist, check for ambiguity, and type checking. If a parse tree passes the preprocessing then it is said to be ***valid***

2.1.3 Logical Query Plan

The first step is to modify the parse tree into using operators and operators of relational algebra.

The next step is to convert expression obtained from the above substitution and modify it into an expression which can be converted to most efficient physical query

plan.

To improve the algebraic expression obtained, few common steps taken are pushing down selections and projections carefully, carefully placing duplicate eliminations, combining selections, showing associativity and commutivity in the expression to help with enumeration.

At the end when we have the expression ready, we enumerate the physical plans and calculate their cost of execution and select the method with the lowest cost.

2.1.4 Cost Estimation

We need to consider what algorithm each operator in the expression is going to use, such as join, sort, scanning and more. Also need to consider the order for the associative and commutative operators, because at the end the operators are binary and how the output of one operator is provided as an input to the next/ outter operator in the expression.

2.2 System R

2.3 Deep Reinforcement learning

Markov decision process(MDP) is used to formalize various types of stochastic processes. In MDPs, the goal of the agent is to make a sequence of actions to optimize/ maximize an objective function.
Formally a MDP is a $5-$*tuple*

$$\langle S, A, P(s,a), R(s,a), s_0 \rangle$$

$S \rightarrow$ *Set of all possible states the agent can be in.*

$A \rightarrow$ *Set of all possible actions the agent can take.*

$P(s,a) \rightarrow$ *A probability distribution of going to various states given current state and action.* $s^1 \sim P(s,a)$

$R(s, a) \rightarrow$ *Reward for taking action* a *on state* s.

$s_0 \rightarrow$ *Describes the initial state of the system/ agent.*

The performance of the agent is measured using the rewards collected along the way through various states. So the objective of an MDP is to find a policy $\pi : S \rightarrow A$*, a function that maps states to actions, in order to maximize the expected value:-*

$$\underset{\pi}{\operatorname{argmax}}\, \mathbb{E}\left[\sum_{t=0}^{T-1} R(s_t, a_t)\right]$$

$$\textit{subject to } s_{t+1} = P(s_t, a_t), a_t = \pi s_t$$

This method does not reduce the search space, and unlikely greedy solution, this will lead to an optimal solution. This method does not reduce the search space, and unlikely greedy solution, this will lead to an optimal solution.

Reinforcement learning(RL) is a technique which optimizes MDPs iteratively, by running a simulation in each iteration and changing the policy to find an optimal one based on the cumulative reward.

2.4 Relations

A common method/ data structure used to formalize joins

Query Graph $\rightarrow$ *A query graph* G *is an undirected graph, where each relation* R *is a vertex and each join predicate* ρ *defines an edge between* 2 *vertices. Let* κ_G *denote the number of connected components in* G

A join of relation R_1, R_2*, in the graph corresponds to remove the vertices* v_{R_1}, v_{R_2}*, replacing them with a vertex* $v_{R_1+R_2}$*, the edges of the form* $(v_{R_1}, v)\&(v_{R_2}, v)$ *are replaced by* $(v_{R_1+R_2}, v)$*. Note each reduction reduces number of vertices by one, so this process is repeated until there are* κ_G *number of vertices left.*

Join Optimization Problem $\rightarrow$ *Let G be a query graph and J be a join cost model. Find sequence, $c_1 \circ c_2 \circ ... \circ c_n$ resulting in $|V| = \kappa_G$ to minimize*

$$\min_{c_1, c_2, ... c_n} \sum_{i=1}^{n} J(c_i)$$

$$\textit{subject to } G_{i+1} = c(G_i)$$

Using these definitions, we define a MDP.

$$\langle \{G_0, G_1, ... G_T\}, c, P(G, c), -J, G \rangle$$

We are still not certain about how the cost function J is structured. We are still not certain about how the cost function J is structured. We are still not certain about how the cost function J is structured.

We are still not certain about how the cost function J is structured.

Chapter 3

Conclusions

3.1 Summary of the thesis

Time to get philosophical and wordy.

IMPORTANT: In the references at the end of thesis, all journal names must be spelled out in full, except for standard abbreviations like IEEE, ACM, SPIE, INFOCOM, ...

Appendix A

Proof of xyz

This is the appendix.

CURRICULUM VITAE

Joe Graduate

Basically, this needs to be worked out by each individual, however the same format, margins, typeface, and type size must be used as in the rest of the dissertation.