The Graduate Writing Center

Overview
Learning how to write effective abstracts is a critical skill for graduate students and academics. This packet defines and describes how abstracts are used for indexing and selection purposes. It also introduces different types of abstracts with examples as well as provides step-by-step guidelines to write concise and informative abstracts. Finally, it offers practical strategies for creating strong and searchable titles.

A Note About This Workshop and The Graduate Writing Center

Please note that our series of graduate workshops on writing are designed to address general writing principles. As a result, you may not find information in this packet or during the workshop that is directly relevant to your field or your current study. The best way to view these workshops is as opportunities to be exposed to general skills that should transfer across disciplines. That means attending these workshops is **not a substitute** for reading extensively in your field and asking questions of advisors and peers.

The Graduate Writing Center provides free one-on-one peer consultations and interactive workshops for Penn State graduate students of all disciplines and all levels of writing ability at any stage of the writing process across a range of genres: presentations, seminar papers, theses, dissertations, article manuscripts, professional documents, et al. Our consultations focus on principles of composition and strategies for enabling writers to independently improve their writing. While we will not "correct" papers or proofread, we are happy to answer any questions that you have about your work.

Scheduling an appointment with a Graduate Writing Center consultant is an excellent way to follow up on the practical information you receive during our workshops. Please note that the appointment schedule is posted one week in advance (Friday at 4PM) and appointment times book quickly.

To learn more about the Graduate Writing Center or to sign up for an appointment using our online schedule, visit http://composition.la.psu.edu/resources/graduate-writing-center.

1. Introduction

1.1 What is an Abstract?

An abstract is a concise and accurate summary of the contents of a longer work. In writing an abstract, you should "introduce the problem or question that motivated the work" (Mott, 2014) and present key findings about how you have addressed or answered that research problem or question and the broader implications of your research. In this respect, writing an abstract requires two different kinds of work: text work--producing the actual content for your abstract, and identity work--establishing an authoritative position about a specific research topic (Marshall, 2010).

Abstracts are self-contained (meaning they can be read independently from the original text) and informative. Based on an abstract alone, readers should be able to survey the contents of the full article. Although all abstracts share some structural characteristics in common, there is some variation *across different disciplines*. Abstracts prepared for scientific writing often include the scope, purpose, methods, and results of a study; abstracts prepared for the humanities often contain the exigence, intervention, analysis, and conclusion of a study. It's important to consult the specific guidelines required by the publication venue before you begin writing.

1.2 How are Abstracts Used?

Abstracts help readers who are potentially interested in your work to be able to make a decision about whether they will continue to read the original work or whether your work should be considered for publication. For example, conference abstracts are vetted by a selection committee to determine who will present at the conference. Research abstracts for a scholarly article distill complex ideas into a cogent and understandable argument.

In addition to helping readers work more efficiently, abstracts are also an important part of indexing and selection processes used by online databases. Indexing refers to the process by which libraries and other online databases catalogue information for search and retrieval purposes. When a researcher enters key terms or phrases into a database search, a search engine will look for those words in titles and abstracts. For this reason, it's very important to consider what terms other researchers in your field will use in a search process. Selection refers to the filters used by researchers to narrow a search result. These filters depend on bibliographic information provided by the publisher (i.e. date of publication, publication venue) and the descriptive information provided in the title and abstract. Because titles provide a necessarily limited amount of information, many online databases use a "full-search" feature that culls abstracts for retrieval purposes.

The ease with which researchers can access and retrieve a source will greatly impact its overall circulation and readership. Because abstracts and titles play such an important role in making

your work visible, Marshall (2010) argues that they should be treated "an integral part of (your) research rather than something to be tacked on at the end."

2. Common Problem in Writing an Abstract

- The abstract length does not meet the recommendation or requirements;
- The abstract includes information that is not relevant to the purpose or findings of the original article;
- The abstract does not convey the most important idea or information from the original article--fails to accurately reflect a writer's work;
- Or, the abstract includes information that is not included in the original article.

A poorly written abstract looks more or less like what follows:

This paper discusses research, which was undertaken in the author's country. A theoretical framework is developed from a literature search and this is used by the authors as the basis of an analytical model. The researchers collected data within this framework and analysed it according to the precepts laid down by earlier researchers in the field. The data is used to demonstrate that our understanding can be significantly increased and this is discussed in the light of previous work. Conclusions are drawn and it is shown that these may be useful for practitioners.

3. Types of Abstracts

- Research article (RA) abstracts (150~200 words)
- Conference submission abstracts (500 words)
- U.S. PhD dissertation abstracts (350 words)
- *Abstracts for short communications (50 words)

3.1 Research Article Abstracts

- **Unstructured abstracts**, or traditional abstract, present the research purpose, method, results, and conclusion in a continuous narrative. Unstructured abstracts are in fact well-structured documents, though they do not have explicit labels.
- **Structured abstracts** arrange information according to prescribed headings. They are more common in articles which describe experimental research in the medical fields, biological sciences, and some areas of psychology.

3.1.1 Rhetorical Moves in Unstructured Abstracts

Five rhetorical moves are commonly present in abstracts across disciplines. Their terminologies may vary, but they follow a typical order as follows:

Move #	Typical labels	Implied questions
Move 1	Background/introduction/situation	What do we know about the topic? Why is the topic important?
Move 2	Present research/purpose/objective	What is this study about?
Move 3	Methods/materials/subjects/procedures	How was it done?
Move 4	Results/findings	What was discovered?
Move 5	Discussion/conclusion/implications/recommendations	What do the findings mean?

Though many abstracts perform all five rhetorical moves, some do not follow them closely, leaving one or two moves out. Others combine two moves in one, saving space for other moves they consider important. Below are two RA abstracts, one from Perinatology and the other from Bioenergy. The first abstract does not inform the reader about the general state of the field [Move 1] and begins with a statement of research objective [Move 2]. By contrast, the second abstract uses one sentence to summarize research purpose [Move 2] and method [Move 3].

Abstract #1
1) The object of this study was to evaluate postpartum women for psychiatric symptomatology including cognitive disturbances, anxiety, depression, and anger to better meet their needs for support and involve them in the care of their infants. **[Move 2]** 2) We interviewed 52 postpartum mothers at the Bronx Lebanon Hospital Center within 5 days of delivery and determined the presence of psychiatric symptoms using the 29-item Psychiatric Symptom Index. **[Move 3]** 3) Despite the fact that adult mothers were happier when they were pregnant (71.4% versus 29.4%; p=0.010) and less likely to be worried about their baby's health (25.7% versus 52.9%; p=0.003), adult mothers demonstrated higher depressive symptomatology (p=0.009), higher amounts of anger (p=0.004), and greater overall psychiatric symptomatology (p=0.005) than adolescent mothers. 4) Mothers whose infants were in the neonatal intensive care unit did not report significantly higher psychiatric symptomatology than mothers whose infants were healthy. **[Move 4]** 5) Physicians need to be aware of the high levels of depression and anger present among postpartum women so appropriate support can be given. **[Move 5]**

Abstract #2
1) Renewable energy policies in the electricity and transportation sectors in the United States are expected to create demand for biomass and food crops (corn) that could divert land from food crop production. **[Move 1]** We develop a dynamic, open-economy, price-endogenous multi-

market model of the US agricultural, electricity and transportation sectors to endogenously determine the quantity and mix of bioenergy likely to be required to meet the state Renewable Portfolio Standards (RPSs) and the federal Renewable Fuel Standard (RFS) if implemented independently or jointly (RFS & RPS) over the 2007-2030 period and their implications for the extent and spatial pattern of diversion of land from other uses for biomass feedstock production. **[Move 2 and 3]** We find that the demand for biomass ranges from 100 million metric tons (MMT) under the RPS alone to 310 MMT under the RFS & RPS; 70% of the biomass in the latter case can be met by crop and forest residues, while the rest can be met by devoting 3% of cropland to energy crop production with 80% of this being marginal land. **[Move 4]** Our findings show significant potential to meet current renewable energy goals by expanding high-yielding energy crop production on marginal land and using residues without conflicting with food crop production. **[Move 5]**

Activity #1: Below are five more journal article abstracts. Choose the one closest to your own area and consider the following questions:
1) How long is your chosen abstract? How does it compare to the expected length of your field?
2) What is the main tense used in this abstract? Why is this tense used? What is typical in your field?
3) Has your chosen abstract used citations or references? Is this typical in your experience?
4) Does the abstract use *I* or *we*? What is your experience in your field?
5) Does the abstract follow the rhetorical moves? What moves have been included? What is typical in your field?

Electrical and electronic engineering
OpenPET has recently been developed as a modular, flexible data acquisition (DAQ) platform for nuclear imaging applications. We present a description of the system architecture and DAQ implementation using OpenPET for a small animal positron emission tomography (PET) insert designed for hybrid PET/magnetic resonance imaging (MRI) at 7T. The PET insert consists of 16 silicon photomultiplier-based detector modules, creating a total of 64 analog channels. The OpenPET system used consisted of four 16 channel detector boards connected to one support board (SB), in turn connected to a Host PC via a USB2.0 interface. Both detector and SBs contain field-programmable gate arrays, allowing customized firmware for both. The initial OpenPET firmware release allowed data capture in oscilloscope mode only, limiting data collection to a system single events rate of 18.8 kcps. Customized firmware changes were implemented in four revisions, resulting in a final version using an 8 byte data packet and supporting a system single events rate of > 4.5 Mcps. Noise equivalent count rate (NECR) results are presented for each firmware revision, showing improvement from peak NECR of 1.0 kcps @ 0.6 MBq to 19.5 kcps @ 15.3 MBq. The final version of the firmware enables its routine use in small animal PET/MRI.

Education

For many years, changing beliefs has been considered a prerequisite for changing classroom practices. However, professional development research has also shown that the opposite relationship is also true-change in practice can precede change in beliefs. This study investigated the effect of a one-year professional development program on in-service science teachers' instructional practices, beliefs, and their students' achievement. The professional development program specifically emphasized supporting middle school in-service science teachers to implement inquiry-based instruction. A non-random, single group, interrupted time-series, quasi-experimental design was used to test Guskey's model of staff development and the relationships among changes in teachers' instructional practices, beliefs and their students' achievement. Similar to Guskey's model, findings from this study show the importance that evidence of improved student achievement has on teachers changing their practices. Teacher change models emerging from our data did not find any links between general teacher change variables. However, factors such as teachers' focus on discourse and curriculum were found to be important components of inquiry-based instruction and teachers' contextual beliefs.

Plant biology

The endogenous peptides AtPep1-8 in Arabidopsis mature from the conserved C-terminal portions of their precursor proteins PROPEP1-8, respectively. The two homologous leucine-rich repeat-receptor kinases (LRR-RKs) PEPR1 and PEPR2 act as receptors of AtPeps. AtPep binding leads to stable association of PEPR1,2 with the shared receptor LRR-RK BAK1, eliciting immune responses similar to those induced by pathogens. Here we report a crystal structure of the extracellular LRR domain of PEPR1 (PEPR1LRR) in complex with AtPep1. The structure reveals that AtPep1 adopts a fully extended conformation and binds to the inner surface of the superhelical PEPR1LRR. Biochemical assays showed that AtPep1 is capable of inducing PEPR1LRR-BAK1LRR heterodimerization. The conserved C-terminal portion of AtPep1 dominates AtPep1 binding to PEPR1LRR, with the last amino acid of AtPep1Asn23 forming extensive interactions with PEPR1LRR. Deletion of the last residue of AtPep1 significantly compromised AtPep1 interaction with PEPR1LRR. Together, our data reveal a conserved structural mechanism of AtPep1 recognition by PEPR1, providing significant insight into prediction of recognition of other peptides by their cognate LRR-RKs.

Psychology

Research has established that adverse experiences in childhood are far-reaching. Attachment persists into adulthood, impacted by internal structures that make sense of relational experience. Dunbar (1995) has estimated that humans maintain approximately 150 personal relationships, structured in concentric rings of decreasing intimacy within the active social network. However, no literature exists examining the relationship among adverse childhood experiences (ACEs), adult attachment dynamics, and social networks. Relational mission workers (N=84) completed a self-report questionnaire. Hierarchical multiple regressions revealed that, after controlling for

Extraversion, ACEs and Global Anxiety attachment were significant predictors ofthe size ofthe innermost social network ring, and ACEs predicted the change in ratio between the innermost social network ring and the social network as a whole. Interpersonal, internal factors, such as attachment Style, and experiential, external factors, such as ACEs, can impact the structure and size of an individual's social network.

Asian studies

This paper explores the uneasy position of painting in an early twentieth-century Shanghai publication, the National Essence Journal (Guocui xuebao, 1905-11), published by the prominent and influential Society for Preservation of National Learning (Guoxue baocunhui). The publication is like international expositions and museums in peculiar ways; the Chinese paintings in it, devoted to the nation, are paradoxically invisible. In the article I explore how and why, establishing the ways in which painting was newly understood to matter in the modern era.

3.1.2 A Step-by-Step Guide to Write an Unstructured Abstract

Getting Started: Move 1 and Move 2

In an abstract, the opening sentences usually announce a study's objective or purpose and raise its stake by foregrounding it in a broader disciplinary conversation. They help set up the expectation the reader holds about a text. Though the abstract should unbiasedly provide an idea about the content of the text, it also functions to promote the text by highlighting its potential contributions. In most disciplines requiring traditional abstracts, four basic types of opening sentences are commonly used.

    A. Starting with a real-world phenomenon or with standard practice

Rainfall influences removal of airborne particulate matter (PM) from leaf surfaces through a process called wash off resulting in throughfall that carries PM to the ground.

Screening for active tuberculosis (TB) and latent TB infection (LTBI) is mandatory to the initiation of biological therapy in patients with rheumatic diseases.

    B. Starting with purpose or objective

We seek to understand the potential genetic impact of introduced species in an ecosystem where conservation efforts and pressure from development co-occur: the Galápagos Archipelago.

The main objective of this work was to determine the impact of pesticide use practices on vegetables contamination in the Niayes zone of Dakar.

    C. Starting with present researcher action

Apparent digestibility and nitrogen (N) balance **were evaluate**d in sheep fed low-quality Cynodon nlemfuensis grass supplemented with different foliages of forage-potential trees.

The bioaccessibility of Ca, Cu, Fe, Mg, Zn, and crude protein **was evaluated** after submitting beef, pork, and chicken to five different thermal treatments.

D. Starting with a problem or an uncertainty

Since the introduction of biologics, many concerns about the increased risk of infections have been reported and, to date, the real impact of infections on the daily practice in the rheumatologic centers **is still largely unknown**.

Little is known about the impact of science fair participation on student science inquiry learning. Furthermore, there is **only a small research** base relating to science fair participation and student attitudes toward science, technology, engineering, and mathematics (STEM) careers and coursework.

Compressing Methods Descriptions: Move 3

Move 3 can include information about data, participants, length of study, location, etc., as well as some indication of the methods used themselves. In other words, a lot of information needs to be packed into a small space.

Unless the contribution made by the paper lies principally in the methodology, method descriptions in RA abstracts may have to be squeezed to make room for more information in other moves. Also, in general, methods moves are more likely to use past tense and the passive.

Moving on to Results: Move 4

Move 4 in RA abstracts are almost universal in all fields. Disciplinary difference notwithstanding, it is a standard practice for many to present the general results first, followed by the specifics. For those that report specific results first, they are usually followed by a concluding statement indicating generality.

The data confirmed the results of sensory evaluations and showed the ability of wild lactobacilli to generate key volatile compounds. **Particularly**, three wild lactobacilli strains….

[Specific results are first, then…] **The combined results for all** treatment steps showed a significant difference between the methods for the CIE L* values.

Concluding a Traditional Abstract: Move 5

Move 5 functions to emphasize the significance of a study. Many in academia choose to skip this move in fear of undermining scientific objectivity. These days when academic publishing has become extremely competitive, more researchers have started to end their abstracts with definite and upbeat conclusions to stress the utility and applicability of their reported results.

Our findings show **significant potential** to **meet** current renewable energy **goals** by expanding high-yielding energy crop production on marginal land and using residues without conflicting with food crop production.

Overall, this study **advances our understanding** that, for moderate to high levels of As contamination, the Binadhan-5,Binadhan-6,Binadhan-8, Binadhan-10 and BRRI dhan47 varieties were **quite promising** to mitigate As induced human health risk.

The results **provided important information** on vegetable contamination status and **pointed an urgent need** to control pesticide use.

These strategies could **serve the larger goals of increasing** student science inquiry understanding and **increasing** positive student attitudes toward STEM fields in a more age-appropriate manner.

3.1.3 Drafting Structured Abstracts

In many ways, "structured" and "unstructured" abstracts are very similar in their content, style, and organization. However, structured abstracts differs from unstructured ones in that they are usually longer and have labeled sub-sections. In comparison to unstructured abstracts, structured abstracts are considered more informative, objective, and accessible. Below is an example of a four-item structured abstract:

A structured abstract from Steinerová and Šušol (2007)

Introduction. The paper is based on the study of library users in Slovakia as part of a larger research project on the use of information.
Method. A large-scale questionnaire survey was conducted in 2002 in 16 academic and research libraries with 793 subjects, especially students and educators.
Analysis. The data were analysed with the use of statistical package SPSS. Gender differences are analysed with regard to ways of information seeking,use of electronic resources and publishing.
Results. Results indicate that men prefer individual information seeking and women apply collaborative information use. By sorting user types it was found that women tended to manifest a pragmatic way of information use (the S type). Men confirmed analytic information processing (the A type). Women declared less experience in the use of electronic resources and publishing. Differences in orientation,collaboration and feelings have been noted.
Conclusion. Gender as a variable can be productive for better understanding of the cognitive and social background of human information processing. Findings can inform the design of services and systems and information literacy policies.

Activity #2 Work in pairs and convert the political science abstract below into a structured abstract. Be sure to include the following labels: Background, Objective, Method, Results, Conclusion, and Recommendation. What difficulties have you encountered when you rewrite the abstract? What are advantages of using structured abstracts? What potential problems can be associated with their use?

1) Many scholars claim that democracy improves the welfare of the poor. 2) This article uses data on infant and child mortality to challenge this claim. 3) Cross-national studies tend to exclude from their samples non-democratic states that have performed well; this leads to the mistake inference that non-democracies have worse records than democracies. 4) Once these and other flaws are corrected, democracy has little or no effect on infant and child mortality rates. 5) Democracies spend more money on education and health than non-democracies, but these benefits seem to accrue to middle- and upper- income groups.

3.2 Conference submission abstracts (500 words)
Conference abstracts are designed to get their authors onto conference programs. The goal then in writing a conference abstract is to impress the review committee, who in fact may have little time to read and assess your proposal. Given the purpose in writing and submitting a conference abstract is to create an opportunity to present your work, your conference abstract will typically be somewhat promotional; in effect, it will typically attempt to **"sell"** your work.

Getting ready
University departments usually circulate conference Call for Papers (CFP) all year around. Be watchful for your department's newsletter and listserv emails. Conference abstracts are usually submitted a few months in advance. Mark conference submission deadlines on your calendar and plan your writing schedule accordingly. Talk to your advisor, professors, or colleagues ahead of you for suggestions. Get to know the acceptance rate, the review process, typical word limits, or any other writing conventions you should follow in the discipline.

Composing the Abstract
The majority of conference abstracts are "unstructured" (i.e., continuous text), sometimes divided into paragraphs. Most unstructured conference abstracts have a six-part organization, though some of them will not have all the parts, or moves.

Move 1: Outlining/promoting/problematizing the research field or topic
Move 2: Justifying this particular piece of research/study
Move 3: Methodological, demographic, or procedural comments
Move 4: Summarizing the main findings
Move 5: Highlighting its outcome/results

Move 6: Further observations/implications/limitations/future developments

Below is a conference abstract submitted to a mid-size Information Technology conference by a doctoral student. It has performed five of the rhetorical moves we discussed earlier. How well does it carry out the moves? How well do the moves included help advertise the abstract?

Collaboratory use and social network change in the space science community

Abstract
1) While collaboration has always played an important role in scientific research, information technology has introduced new opportunities for collaborative research. 2) In particular, collaboratories, which us computer networks to facilitate scientists' access to remote instruments, to remote colleagues, and to archived data, represent a novel environment for scientific collaboration. 3) By diminishing the importance of physical proximity, collaboratories provide a technological basis for new forms of networks of scholars (Wellman, 2002). **[Move 1]** 4) Based on previous studies of information technology use and on the social networks of scientists, it is here hypothesized that collaboratory use may extend network range. 5) One likely pathway for this is by generating more opportunities for junior scientists and those employed by non-doctoral institutions to become inter-connected in ways comparable to the networks of senior scientists at elite institutions. **[Move 2]** 6) On the basis of a survey of space scientists and on an examination of co-authorship relations among those scientists from 1993 to 1996, this longitudinal study compares space scientists' social network structure before and after they adopted the *Upper Atmospheric Research Collaboratory* in order to examine its impact on their scientific work. **[Move 3]** 7) Results of this research indicate that collaboratory use has led to an increase in the network range of the aerospace science community. 8) More specifically, junior scientists and peripheral institutes have become more connected to senior scientists and elite institutions. **[Move 4]** 9) The paper closes by discussing whether the space science collaboratory is typical of others or has distinctively predisposing collaborative features. **[Move 6]**

Revising the Abstract
Seek help from your advisor, professors, or colleagues ahead of you for their feedback on your draft abstract. You are also welcome to review your abstract with a Graduate Writing Center consultant!

Activity #3
Below are drafts of an abstract submitted to a mid-size regional conference. Compare these two drafts and analyze how the revised draft better realizes the rhetorical moves we just discussed. In addition, discuss with your peers how else you would revise this abstract to highlight its research rigor and potential contributions.

Original Draft:

Role of RALF peptides in Mechanical Signaling

ROLE OF RALF PEPTIDES IN MECHANICAL SIGNALING

Rapid Alkalinization Factor (RALF) peptides are named for their ability to alkalinize suspension culture medium. When applied to *Arabidopsis* roots, RALF1 triggers a fast calcium response followed by alkalinization of the surrounding medium along with temporary growth inhibition. A key step in this response pathway is the binding of RALF1 to FERONIA (FER), a receptor-like kinase involved in plant responses to various stimuli. FER has also been implicated in mechanical signaling transduction. *Feronia* mutants show altered calcium signaling and growth responses to mechanical stimulation. The goal of this research is to determine whether RALF peptides are also involved in mechanical signaling and if so, what their role is in the process. To that end, overexpression lines of *RALF1*, *RALFL22*, *RALF23*, and *RALFL33*, closely related RALFs with relatively high expression levels in roots, have been developed and tagged with eGFP. These will be used to determine subcellular localization. T-DNA insertional knockout lines for *ralf1*, *ralfl22*, and *ralfl33* have been obtained, and CRISPR/Cas9 knockout lines for *ralf1*, *ralfl22*, *ralf23*, and *ralfl33* are in the process of being completed, as are double, triple, and quadruple knockouts. *Arabidopsis Col-0* plants have been dipped with *Agrobacterium* containing the CRISPR/Cas9 plasmids for *ralf1*, *ralfl22*, *ralf23*, *ralf1/22*, *ralf1/33*, *ralf1/22/33*, and *ralf1/22/23/33*, and these are currently being screened for transformants. All lines will be tested for mechanical signaling defects by analyzing both root growth kinetics and the pH response following root bending. Any promising lines will be dipped with *Yellow Cameleon 3.6*, a cytosolic calcium ion sensor, to analyze potential changes in the calcium response to mechanical perturbation. The single mutants are expected to have slight if any alterations in mechanical signaling responses due to redundancy, while higher order mutants are expected to show decreased mechanical responsiveness.

Revised Draft:

Rapid Alkalinization Factor (RALF) peptides were named for their ability to trigger extracellular alkalinization in suspension cultured X (species) cells. When applied to *Arabidopsis* roots, RALF1 triggers a fast calcium response followed by alkalinization of the surrounding medium along with temporary growth inhibition. A key step in this response pathway is the binding of RALF1 to FERONIA (FER), a receptor-like kinase involved in plant responses to various stimuli including mechanical cues. *Feronia* mutants show altered calcium signaling and growth responses to mechanical stimulation. The goal of this research is to determine whether FER-dependent mechanical signaling involves RALF peptides. To that end, transgenic Arabidopsis lines have been developed that stably express GFP-tagged *RALF1*, *RALFL22*, *RALF23*, or *RALFL33,* i.e., RALFL belonging to the same subclade and having fairly high expression levels in Arabidopsis roots. Expression of these genes is driven either by 35S overexpression promoters

or by native promoters. The transgenic Arabidopsis lines will be used to determine RALFL expression patterns and subcellular localization as well as effects of overexpression on Arabidopsis growth and development. Single and higher order mutants are being generated and will be tested for defects in mechanical ion signaling and root growth responses to mechanical perturbation. These experiments will provide insight into how the role of FER in mechanical signaling relates to its function as a receptor of the RALF signaling peptide.

3.3 Dissertation Abstracts

Considering that many in attendance are finishing up their dissertations at Penn State, we quoted The Graduate School's requirements and guidelines for the preparation of dissertation abstracts in full: "Every thesis/dissertation must contain an abstract. An abstract is a concise summary of the thesis/dissertation, intended to inform prospective readers about its content. It usually includes a brief description of the research, the procedures or methods, and the results or conclusions. An abstract should not include internal headings, parenthetical citations of items listed in the reference section, diagrams, or other illustrations." The abstract follows the committee page and has the heading ABSTRACT at the top. It always begins on page iii. There is no restriction on the length of the abstract in the thesis/dissertation, but a separate abstract required for the ProQuest/UMI Agreement form is limited to 350 words (doctoral only)." (Penn State The Graduate School, *Thesis and Dissertation Guide*)

For many, the writing of a dissertation abstract is accompanied by the difficult task of fulfilling expectations of dissertation committee chair and members, and negotiating about the writing standards if necessary. Dissertation abstracts, unlike other types of abstracts discussed above, are unique because there are not explicitly articulated rules to be given here. It is therefore important to bear in mind that one has to not only follow the guidelines set by the Graduate School but also solicits clear guidance from one's dissertation advisor and committee members when it comes to composing the dissertation abstract, or the dissertation in general.

For the sake of this presentation, we analyzed the organizational structures of 10 dissertations, all of which were produced by recent graduates from the Information Sciences and Technology program. We found that most of them performed the five rhetorical moves as follow:
Move 1: Introducing background information

Move 2: Raising a research problem or challenge
Such data **present a number of research challenges** in machine learning, network analysis, and causal discovery. The data are incomplete, heterogeneous, highly sparse, and exhibit complex relationships and temporal structure. … Uncovering the causal accounts of the state dynamics of actors **has an important impact in explaining** why people change their preference, emotion, or interest in a specific activity and in predicting actors' future behaviors.

However, compared to other human-computer interaction technologies such as speech recognition, gesture recognition has not been actively applied to personal devices such as mobile phones or laptops due to the spatial requirements when performing gestures as well as sensitivity to background noise.

Move 3: Proposing a solution
We have developed two browser-based casual games, LinkIT and SortIT, and have applied them for three knowledge elicitation applications: relation elicitation, rank elicitation, and probability elicitation.

Toward these challenges, novel models are explored in this dissertation to solve problems of topic evolution and aspect-level sentiment analysis.

Move 4: Announcing research methodologies and procedures

Move 5: Summarizing the main findings and discuss their implications

Below is an abstract submitted as part of a finalized dissertation project. We present it here to exemplify how the five rhetorical moves can be realized.

Topic oriented evolution and sentiment analysis
Topic modeling techniques help people to understand what is talking about in a corpus, and dramatically improve humans work on academic or business productivity. Although these topic modeling techniques can usually handle topic information represented by word frequencies well, they cannot deal with other unstructured text information such as timestamps, sentiments, or opinions. **[Move 1]** However, real applications often have needs to explain topics using both structured and unstructured text information together. When texts have their timestamps, it is necessary to identify different topics at different timestamps and how they evolve overtime. When sentiments or opinions are included in texts, it is necessary to identify human's opinion on certain aspects. **[Move 2]** Toward these challenges, novel models are explored in this thesis to solve problems of topic evolution and aspect-level sentiment analysis.
Two novel models towards topic evolution as follows: (1) The first model, through exploiting social networks in blogsphere, can accurately predict what topics bloggers will talk about in future; and (2) The second model, by applying citation networks in scientific literature, can identify new research topics and how research topics evolve overtime. Three novel models towards aspect-level sentiment analysis as follows: (3) The first model, by incorporating sentiment lexicons as prior knowledge with machine learning approaches such as Support Vector Machine, can significantly improve the accuracy of sentiment analysis; (4) The second model, through semi-supervised Chinese Restaurant Process, can identify new aspects as well as their

sentiments; and (5) The third model, through discovering associations between topic and opinion words, can identify opinionists' standpoints on certain topics. **[Move 3]**

All Five models are rigorously validated using both real and synthetic experimental data. Experiments on these first proposed models are compared with our baselines, and the third model is compared with the state-of-the-art methods. **[Move 4]** The first model can predict future topics in blogsphere for next 4 weeks with high precision (0.94). The second model can construct the map of research topic evolution and measure topic influence with accuracy (0.65) comparable to human ratings (0.76). The third model can significantly improve the accuracy of sentiment analysis by 5% compared with the state of arts methods; The fourth model can find new aspects with high precision (0.82) and recall (0.78); The fifth model can find and visualize most controversial topics and extract opinion sentences to represent opinionists standpoints with high accuracy (0.97). **[Move 5]**

Activity #4

One potential source of difficulty comes from the fact that Penn State requires a dissertation abstract of no more than 350 words. Given that dissertations represent large amounts of research and scholarship, getting the text down to this word limit can often be a daunting task. A common problem with early dissertation abstract drafts is that too much space is taken up with the introductory matter and an outline of methods, leaving insufficient room to do justice to the findings and their implications. What follows is an abstract that goes over the 350 word limit and spends a disproportionate amount of space justifying the research. Work with a partner and discuss how it can improved and reduced to 350 words.

Damage management in database management systems

In the past two decades there have been many advances in the field of computer security. However, since vulnerabilities cannot be completely removed from a system, successful attacks often occur and cause damage to the system. Despite numerous technological advances in both security software and hardware, there are many challenging problems that still limit effectiveness and practicality of existing security measures.

As Web applications gain popularity in today's world, surviving Database Management System (DBMS) from an attack is becoming even more crucial than before because of the increasingly critical role that DBMS is playing in business/life/missioncritical applications. Although significant progress has been achieved to protect the DBMS, such as the existing database security techniques (e.g., access control, integrity constraint and failure recovery, etc.,), the buniness/life/mission-critical applications still can be hit due to some new threats towards the back-end DBMS. For example, in addition to the vulnerabilities exploited by attacks (e.g., the SQL injections attack), databases can be damaged in several ways such as the fraudulent transactions (e.g., identity theft) launched by malicious outsiders, erroneous transactions issued by the insiders by mistakes. When the database is under such a circumstance (attack), rolling back and re-executing the damaged transactions are the most used mechanisms during the system

recovery. This kind of mechanism either stops (or greatly restricts) the database service during repair, which causes unacceptable data availability loss or denialof-service for mission critical applications, or may cause serious damage spreading during on-the-fly recovery where many clean data items are accidentally corrupted by legitimate new transactions. In this study, we address database damage management (DBDM), a very important problem faced today by a large number of mission/life/business-critical applications and information systems that must manage risk, business continuity, and assurance in the presence of severe cyber attacks.

Although a number of research projects have been done to tackle the emerging data corruption threats, existing mechanisms are still limited in meeting four highly desired requirements: near-zero-run-time overhead, zero-system-down time, zero-blockingtime for read-only transactions, minimal-delay-time for read-write transactions. Firstly, to achieve the four highly desired requirements, we propose TRACE, a zero-systemdown-time database damage tracking, quarantine, and recovery solution with negligible run time overhead. TRACE consists of a family of new database damage tracking, quarantine, and cleansing techniques. We built TRACE into the kernel of PostgreSQL. Secondly, motivated by the limitation of TRACE mechanism, we propose a novel proactive damage management approach denoted database firewalling. This approach deals with transaction level attacks. Pattern mining and Bayesian network techniques are adopted in the firewalling framework to mine frequent damage spreading patterns and to predict the data integrity in the face of attack when certain type of attack occurs repeatedly. This pattern mining and Bayesian inference approach provides a probability based strategy to estimate the data integrity on the fly. With this probabilistic feature, the database firewalling approach is able to enforce a policy of transaction filtering to dynamically filter out the potential damage spreading transactions.

4. Writing Titles
Given that the word and space constraints for abstracts, the titles you choose for abstracts can be crucial because they are the first thing a potential reader will read about your work. Before you start working on the title, find out the maximum number of characters or words permitted.

4.1 Tips for Writing a Strong Title
Shannon
1. Make the title as succinct as you possibly can, while still providing an accurate and comprehensive description of your research.
2. Think about keywords that are related to your research topic, methodology, results, and implications.
3. Leave yourself time to craft a title that can describe "what you found," "what you did," or both (Cook and Bordage 2016 and Huth 1999).

Chenchen
1. Consider the possibility of dividing a title by a colon (e.g., The East is Black: Cold War China in the Black Radical Imagination)

2. Phrase your title as a question (e.g., From Receptor-Like Kinases to Calcium Spikes: What Are the Missing Links?)
3. Specify the methodology in the title (e.g., Cardiovascular Protection and Blood Pressure Reduction: A Motor Analysis)
4. Use declarative sentences to promote research results (e.g, Sleep Deprivation Does Not Affect Operative Results in Cardiac Survey)

4.2 Examples of Good Titles

Chemical Speciation of Thallium in Natural Waters Using Catio Exchange Resin

A Case Study of Agroecosystem Health in Honduras: A Focus on the Roles of Livestock in Agricultural Communities

How Asynchronous Learning Technologies May Expand the Need for Computer Skills Training of Education Majors