โครงสร้างเอกสารรายงานการวิจัย[*]
A Starter-File for Research Reports

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บทคัดย่อ

This paper demonstrates the format and common components of IEEE papers developed using the standard LaTeX 2$_\epsilon$ template file. The purpose of this document is to provide a starting point for student research reports. This starter document has been designed to support the Thai language without the need for special commands to switch languages. Students can use this document as a to submit their work in Thai or English.will s learning to develop publishable reports of their findings.

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1 บทนำ

This demo file is intended to serve as a ``starter file'' for IEEE/ACM journal papers produced under LaTeX using the double-column/double-sided page article format. The paper was developed using a web browser and a free account at http://www.overleaf.com reducing the need to download and install LaTeX 2$_\epsilon$ on a local computer.
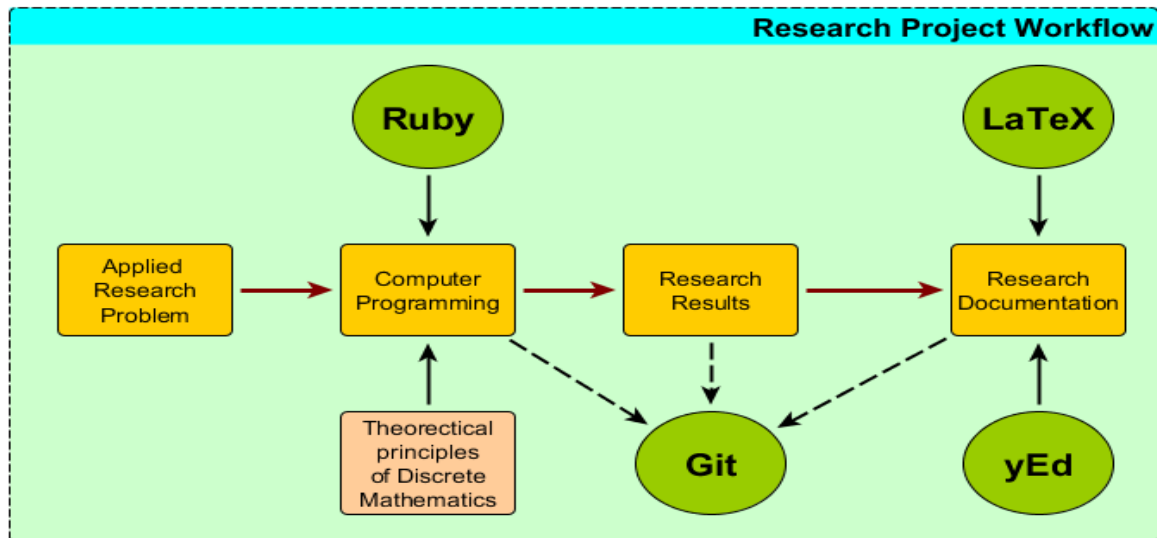
The class logo is seen as a floating illustration in Figure 1.
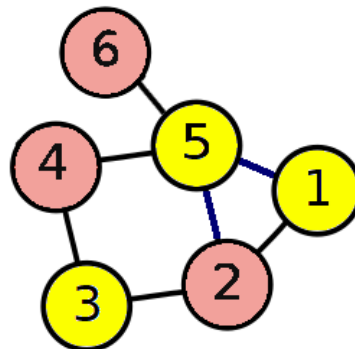
รูปที่ 1: The class logo

In general the Introduction Section needs answer the following questions:

- What is the context of this research and

รูปที่ 2: Typical project work flow.

why is it important? 1.1 Background

- What has already been published about this area? 1.2 Literature Review

- What do you expect to be able to show with this research? 1.3 Purpose and Research Objectives

- What outcomes do you expect? 1.4 Expected outcomes

Summary of the research question. Figure 2 is an example of a double column floating figure that extends to the width of the page.

1.1   หลักการและเหตุผล

Overview and background text to describe why this will be an interesting paper.

1.2   การทบทวนวรรณกรรม

Summary of published papers and references on this subject complete with citation. The class textbook[1] is a good starting point.

ตารางที่ 1: A list of textbooks used for the course

Author	Pages	Doc Type
Code School[2]	20	Ruby
Kopka[3]	559	LaTeX
Kwong[4]	307	DisMath
Levin[1]	345	DisMath
Oetiker et als[5]	63	LaTeX
Pine[6]	216	Ruby
Stein et als[7]	526	DisMath
Thomas[8]	863	Ruby
สมชาย ประสิทธิ์จูตระกูล[9]	339	DisMath

1.3 ปัญหาที่พบ

It is also good to include relevant mathematic formula. This is relatively easy to do as shown by the Taylor series for approximating the value of e^x given in Equation 1.

$$e^x = \frac{x^0}{0!} + \frac{x^1}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + ... = \sum_{n=0}^{\infty} \frac{x^n}{n!} \quad (1)$$

One can include flowing text as well as seen in Table 2

ตารางที่ 2: Thai Proverbs

ภาษาไทย	English
งมเข็มในมหาสมุทร	Look for a needle in a haystack.
ขี่ช้างจับตั๊กแตน	Use a sledgehammer to crack a nut.
น้ำตาลใกล้มด	Bees around honey
นกน้อยทำรังแต่พอตัว	Living within your means
แมวไม่อยู่ หนูร่าเริง	When the cat's away the mice will play.

1.4 ผลที่คาดว่าจะได้

Clearly state the postulated or expected results of this work. Provide a listing of the hypothetical outcomes.

สมมติฐานที่ 1 The better the answer, the higher the score.

สมมติฐานที่ 2 The higher the score the better the grade

ตารางที่ 3: Programming environment

Parameter	Value
CPU	Z80, 1 MHz
RAM Memory	16 K
Ext Memory	1 MB
Programming language	C
Communication	Bluetooth

2   ระเบียบวิธี

Describe the programming environment and the approach used to collect data to address the research question being addressed. Many parameters can be listed in a simple table as shown in Table 3
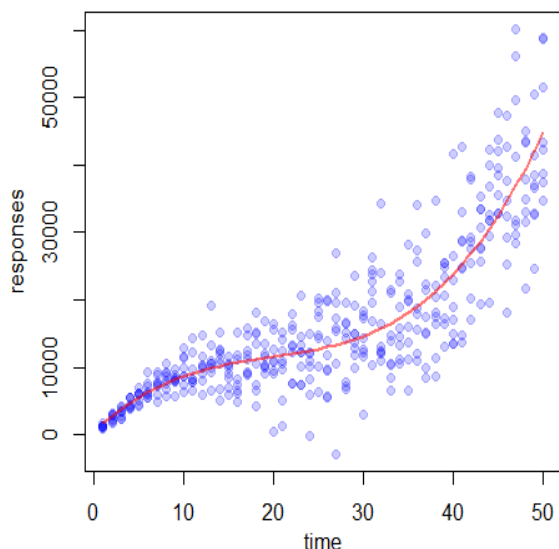
A simple flowchart like that in Figure 3 is a great way to illustrate the critical logic.
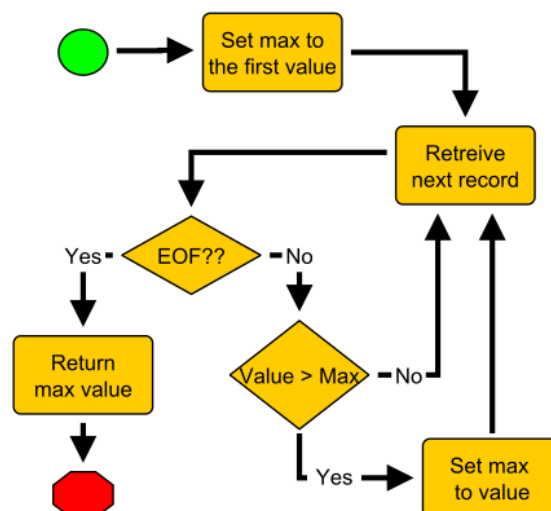
รูปที่ 3: Logic of the Max() Function

3 ผลการวิจัย

Provide tables and graphs that summary of the information collected. Figure 4 is a scatterplot of experimental data.


รูปที่ 4: Experimental data

Floating figures will be placed in the next appropriate place. For example, Figure 5 is a histogram created in R.

4 ข้อสรุป

Interpret and summarize the meaning of the results. It is often useful to use bullet points to highlight the critical outcomes. The outcomes need to be compared to the expectations.

- Retrieval speed of data decreases linearly with the array size.
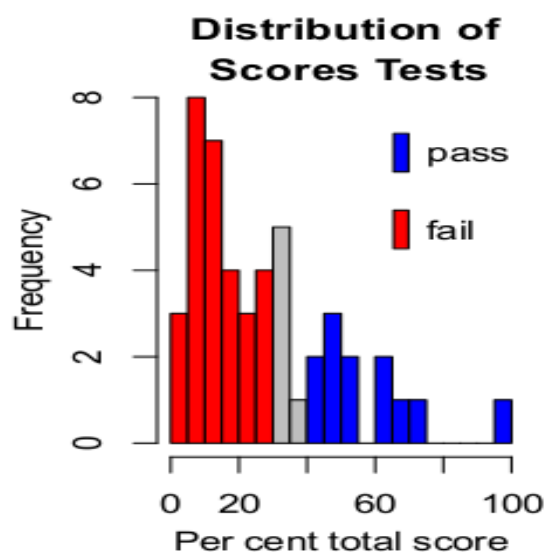
รูปที่ 5: Freshmen Math Grades

- Energy consumption is proportional to the time required.

- Search for elements within a sorted list decreases both the time and energy required for data retrieval.

The final paragraphs should suggest the following:

- implications of this research (Using indices make programs run faster and greener).

- a future direction for this research. (Further work is needed to determine the efficiency of different kinds of indices.)

คำกล่าวขวัญ

The authors would like to thank their students for their feedback and insights gained while using this to create their papers.

ภาคผนวก

หลักฐานทางคณิตศาสตร์

Appendices can contain supporting details such as mathematical proofs, questionnaires and work flow descriptions.

It is also possible to include code segments in the paper using the verbatim mode. This is a super fancy version to demonstrate the wide range of formatting options available including highlight, colors and floated placement.

ตัวอย่างโค้ดที่ 1: Mean Function in Ruby

```ruby
def mean(list)
  if list.size < 1
    return(nil)
  elsif list.size == 1
    return(list[0])
  end

  avg = 0
  list.map{|x| avg = avg + x}
  return(avg / list.length)
end
```

อัลกอริทึมที่ใช้

Formal psuedocode of algorithms are supported as a separate environment.

Algorithm 1 illustrates the Euclidean algorithm for determining the greatest common divisor dates back to 300BC.

ขั้นตอนวิธีที่ 1 Euclid's algorithm

1: **procedure** Euclid(a, b) $\triangleright$ GCD of a and b
2: $\quad r \leftarrow a \bmod b$
3: $\quad$ **while** $r \neq 0$ **do** $\qquad \triangleright$ Finished if $r = 0$
4: $\qquad a \leftarrow b$
5: $\qquad b \leftarrow r$
6: $\qquad r \leftarrow a \bmod b$
7: $\quad$ **end while**
8: $\quad$ **return** b $\qquad \triangleright$ The gcd is b
9: **end procedure**

หนังสืออ้างอิง

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