Best Practices Guide for Satisfactory Research

* Advisor and advisee should agree upon several goals for the semester that could ideally be completed in parallel. Some goals may be ambitious, but a clear minimum level of achievement that constitutes satisfactory research should be agreed upon. The goals should include or align with satisfactory progress towards the degree (proposal, qualifying exam, 5 dissertation defense).

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| Major Goals | Anticipated completion date |
| 1. Have a clear understanding of the research topic for the next six to eight months. | 6 weeks |
| 1. Have a working R program that implements new methods | 15 weeks |
| 1. Read Recommended Chapters of the book, Intro. To Robust Estimation and Hypothesis Testing. 2. Read more journal papers that relevant to the research. | 10 weeks |

I \_\_\_\_\_<advisee/signature>\_\_\_\_\_ agree that I must \_\_\_\_<accomplishments >\_\_\_\_\_\_ to earn a grade of SR.

* Advisees are encouraged to keep a brief weekly or monthly log that outlines weekly/monthly assigned objectives and outcomes, and have the log signed by advisor.

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| Week | Assigned objective for this week | Outcome | For next week |
| 1 |  |  |  |
| 2 | -Estimate power of SW test for Uniform and Exponentially distributed samples  - Estimate power and power loss of downstream t test  -Estimate inflation of Type I error rate of downstream t test | -Results of power loss and inflation of Type I error rates don’t look as expected. | Repeat methods using different distns. Choose dist’n purposely.  Do one sample t test using the same procedures. |
| 3 | -Read relevant cited papers in the article “*Assumption‑checking rather than (just) testing: The importance of visualization and effect size in statistical diagnostics.”*  -debug rcode on simulations on distributions with unreasonable results (Weibull distn and others). | - I could not read the papers cited in the article.  - I fixed the rcodes and the results looks good | -Read Chapter 1 of the book “Intro. To robust estimation and hypothesis testing.” |
| 4 | -Run more simulations on heavy tailed distributions | -I read and made a summary of chapter 1 of the book “Intro. to robust estimation and hypothesis testing.” | -Read chapter 2 of of the book “Intro. to robust estimation and hypothesis testing.” |
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Example of Major Goals

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| Major Goals | Anticipated completion date |
| 1. Develop R code that implements the 2 main existing methods | Week 8 |
| 1. Finish reading papers a, b, c, d. | Week 8 |
| 1. Develop expressions for M step in parameter estimators in new method and Implement R code. | Week 15 |

I \_\_\_\_\_Benedict Kongyir agree that I must \_\_\_\_Goals 1 and 2\_\_\_\_\_\_ to earn a grade of SR

Example of weekly progress report.

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| Week | Assigned objective for this week | Outcome | For next week |
| 1. | MG1: Read R Vignette and run some sample code provided.  MG2: Read paper a. | MG1: Read. Some code didn’t work.  MG 2: Question about theorem 2 in a. Read paper b. | MG1: Read about error messages and try to understand. Try small simulated data set  MG2: Provide example where conditions of thm 2 satisfied and verify. Continue with paper b, c |
| 2. | MG1: Read about error messages and try to understand. Try small simulated data set  MG2: Provide example where conditions of thm 2 satisfied. Continue with paper b, c | MG1: Matrix rank deficient is cause. Small simulated data set worked.  MG2: Uniform distribution example verified. Read b and c. | MG1: Determine why design matrix is rank deficient and methods for modifying it. Implement for data set.  MG2: Read paper d. Provide strengths and weaknesses for a – d and relate to data set. |
| 3. |  |  |  |
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Characteristics of a good advisee are below

* + Always on time and well prepared for each meeting. Schedules meetings with advisor.
  + Shows initiative – does research beyond expected (reads extra articles, runs a simulation study to debug, etc).
  + Learns from mistakes
  + Has a positive attitude
  + Self-aware (some examples below). “Know what you know and know what you don’t know”
    1. Good: “This method can’t be applied here or this theorem isn’t true because ….[proof or counter example provided]”
    2. Good: “I’m not sure if this method can be applied or if this theorem is true because I haven’t been able to verify the third equality in the proof of line 3
    3. Good: I’m not able to get output from the M step in the algorithm yet. Data inputted needs processed differently. I’m reading the help file and vignette”
    4. Good: “I can see that you don’t follow my reasoning for this. Let me work on improving my communication and get back to you.”
    5. Poor: This method can’t be applied here or this theorem isn’t true because there are bugs in the code
    6. Poor: This theorem can’t be true: I can’t verify the proof.