

# Dissertation Outline

Acknowledgements

Table Of Contents

List of Tables

List of Figures

List of Abbreviations

Glossary

## Chapter 1: Introduction

1.1 Background: the role of ACC and dlPFC in supporting flexible behavior

1.2 The Dataset

1.3 Task factors that affect the amount of attention needed

1.4 Summary of Dissertation: Motivation and Approach

## Chapter 2: Synchronous Oscillatory Neural Ensembles for Rules in the Prefrontal Cortex

Abstract

2.1 Introduction

2.2 Results

2.2.1 Behavioral and Single Unit Evidence for the Dominance of the Orientation Rule

2.2.2 Rule-Selective LFP Synchronization between Pairs of Electrodes

2.2.3 Task-Relevant Neurons Were Synchronized to the Current Rule Ensemble

**2.2.4 Beta Orientation Ensemble Shows Stronger Alpha Color Selectivity**

**2.2.5 Rule-Dependent Synchrony Correlates with Behavioral Reaction Time**

**2.3 Discussion**

**2.3.1 Linking Task-Relevant Neurons with Rule-Dependent Synchrony**

**2.3.2 Coordination of Neural Ensembles**

**2.4 Experimental Procedures**

**2.4.1 Recording Locations and Techniques**

**2.4.2 Behavioral Task**

**2.4.3 Behavioral and Neural Analysis Methods**

**2.4.4 Synchrony Analysis Methods**

**Supplemental Information**

**Chapter 3: Analysis of ACC and dlPFC-ACC Synchrony**

**Chapter 4: The Functional Contribution of ACC and dlPFC Neurons to Circuit-level Dynamics and Behavior during Task Switching**

**4.1 Introduction**

**4.2 Results**

**4.3 Discussion**

**4.4 Experimental Procedures**

**Supplemental Information**

## Chapter 5: New Tools for Web-Enabled Dynamic, Interactive Visualizations in Neuroscience

### Abstract

#### 5.1 The purpose of visualization in science

#### 5.2 Limitations of static visualizations in neuroscience

#### 5.3 The benefits of web-enabled dynamic, interactive visualizations

5.3.1 Interactive visualizations can help us quickly make comparisons and deal with complexity

5.3.2 Dynamic visualizations, when combined with interactivity, can help us understand complex data by preserving relationships between data

5.3.3 Web-enabled visualizations are familiar, easily shareable, and enable analysis transparency

#### 5.4 Related Work

#### 5.5 Design Rationale and Approach: potential pitfalls and challenges for our visualizations

5.5.1 What types of interactive visualizations are most useful for neuroscientists?

5.5.2 What is the best way to make interactive visualizations that are easy to use and accessible to other neuroscientists?

5.5.3 How do we make interactive visualizations customizable for use on a variety of datasets?

5.5.4 What are the best tools for creating interactive visualizations?

#### 5.6 Case Study: RasterVis

#### 5.7 Case Study: glmVis

#### 5.8 Case Study: SpectraVis

#### 5.9 Linking RasterVis, SpectraVis, and glmVis

#### 5.10 Future Plans

3

## Chapter 6: Conclusion

## Appendix

## Bibliography