

# Contents

<b>1</b>	<b>A Gentle Introduction to Python</b> . . . . .	<b>1</b>
	Installing Python . . . . .	2
	Windows . . . . .	2
	macOS and Linux . . . . .	2
	Installing Python Modules . . . . .	3
	Python Shell . . . . .	4
	Script Editors . . . . .	6
	Data Types . . . . .	7
	Numbers . . . . .	7
	Strings . . . . .	7
	Booleans . . . . .	9
	List . . . . .	10
	Tuple . . . . .	10
	Dictionary . . . . .	11
	Set . . . . .	12
	Operators . . . . .	13
	Data Conversion . . . . .	14
	Control Flow . . . . .	14
	<i>if</i> Statement . . . . .	15
	<i>for</i> Statement . . . . .	16
	<i>while</i> Statement . . . . .	17
	More on Looping . . . . .	18
	List Comprehension . . . . .	19
	Functions . . . . .	20
	Output . . . . .	21
	Output Formatting . . . . .	21
	Files . . . . .	22
	Modules . . . . .	24
	Choose a Python Module to Build Your Experiments . . . . .	25

<b>2</b>	<b>Building Experiments with PsychoPy</b> .....	27
	Installing PsychoPy .....	28
	A Basic PsychoPy Script .....	29
	Opening a Window .....	31
	Screen Units .....	32
	Monitor .....	33
	Gamma .....	33
	Vertical Blanking .....	34
	Call a Function on Window Flip .....	35
	Taking Screenshots .....	36
	Visual Stimuli .....	38
	Shapes .....	38
	GratingStim .....	40
	TextStim .....	43
	Aperture .....	45
	Mouse .....	47
	Keyboard .....	49
	Monitoring Keyboard Events with the Event Module .....	49
	Monitoring Keyboard Events with PsychHID .....	51
	Trial Control .....	52
	A Real Example: Simon Effect .....	55
<b>3</b>	<b>Building Experiments with Pygame</b> .....	65
	Installing Pygame .....	66
	Display .....	67
	Events .....	71
	Other Frequently Used Pygame Modules .....	73
	The <i>draw</i> Module .....	73
	The <i>font</i> Module .....	75
	The <i>image</i> Module .....	77
	A Real Example: Posner Cueing Task .....	77
<b>4</b>	<b>Getting to Know Pylink</b> .....	85
	A Brief Introduction to Eye Tracking .....	85
	Installing Pylink .....	87
	The “install_pylink.py” Script .....	87
	Manually Install Pylink .....	88
	Installing Pylink Using <i>pip</i> .....	89
	An Overview of An Eye-Tracking Experiment .....	89
	Connect/Disconnect the Tracker .....	91
	Open/Close EDF Data File .....	92
	Configure the Tracker .....	93
	Open a Window for Calibration .....	93
	Calibrate the Tracker .....	93
	Start/Stop Recording .....	94

Log Messages . . . . .	95
Retrieve the EDF Data File . . . . .	95
A Real Example: Free Viewing . . . . .	95
Preamble Text in EDF File . . . . .	99
Offline Mode . . . . .	99
EyeLink Host Commands . . . . .	100
Calibration Window . . . . .	100
Record Status Message . . . . .	100
Drift Check/Drift Correction . . . . .	101
Log Messages . . . . .	102
Error and Exception Handling . . . . .	102
<b>5 Preparing Scripts that Support Analysis and Visualization in Data Viewer . . . . .</b>	<b>107</b>
Trial Segmentation . . . . .	108
Trial Variables . . . . .	111
Interest Areas . . . . .	112
Background Graphics . . . . .	115
Images . . . . .	116
Video . . . . .	119
Simple Drawing . . . . .	120
Draw List File . . . . .	122
Target Position . . . . .	123
Example Scripts in PsychoPy . . . . .	125
Stroop Task . . . . .	125
Video . . . . .	133
Pursuit Task . . . . .	138
<b>6 Accessing Gaze Data During Recording . . . . .</b>	<b>145</b>
Samples and Events . . . . .	145
Accessing Sample Data . . . . .	147
Commands for Accessing Samples . . . . .	148
An Example in PsychoPy: Gaze-Contingent Window . . . . .	153
Accessing Eye Events . . . . .	156
Commands for Accessing Events . . . . .	157
An Example in PsychoPy: Gaze Trigger . . . . .	166
<b>7 Advanced Use of Pylink . . . . .</b>	<b>171</b>
Drawing to the Host PC . . . . .	171
Draw Simple Graphics on the Host . . . . .	171
The bitmapBackdrop() Function . . . . .	172
The imageBackdrop() Function . . . . .	176
Sending TTLs via the Host PC . . . . .	177
Calibration and Custom CoreGraphics . . . . .	180

**8 Eye Movement Data Analysis and Visualization** . . . . . 197

  EyeLink EDF Data File . . . . . 198

    Samples . . . . . 198

    Events . . . . . 199

    Other Useful Information in the EDF Data File . . . . . 200

  EDF Converter . . . . . 201

  Extract Data from the ASC Files . . . . . 203

    Parse ASC Files with the String Function split() . . . . . 204

    Parse ASC Files with Regular Expressions. . . . . 209

  Data Visualization . . . . . 212

    Gaze Trace Plots . . . . . 212

    Heatmap . . . . . 216

    Scanpath . . . . . 221

    Interest Area-Based Plots . . . . . 222

**References** . . . . . 225

**Index.** . . . . . 227