Detecting High-functioning Autism in Adults Using Eye Tracking and Machine Learning

I. TASKS IN STUDY 1 AND STUDY 2

TABLE I
PAGES, COMPLEXITY AND SEARCH TASKS FOR STUDY 1

Task (Complexity)	Search Tasks
Apple (Low)	a) Can you locate the link that allows to watch the TV ads relating to iPad mini?
	b) Can you locate a link labelled iPad on the main menu?
Babylon (Low)	a) Can you locate the link that you can download the free version of Babylon?
	b) Can you find and read the names of other products of Babylon?
AVG (Medium)	a) Can you locate the link which you can download the free trial of AVG Internet Security 2013?
	b) Can you locate the link which allows you to download AVG Antivirus Free 2013?
Yahoo! (Medium)	a) Can you read the titles of the main headlines which have smaller images?
	b) Can you read the first item under the News title?
GoDaddy (High)	a) Can you find a telephone number for technical support and read it?
	b) Can you locate the text box where you can search for a new domain?
BBC (High)	a) Can you read the first item of Sport News?
	b) Can you locate the table that shows market data under the Business title?

II. CLASSIFIER SELECTION (STUDY 1)

III. RESULTS IN STUDY 1

IV. RESULTS FOR GENDER AND COMPLEXITY IN STUDY 2

TABLE II
PAGES, COMPLEXITY AND SYNTHESIS TASKS FOR STUDY 2

Page (Complexity)	Synthesis Tasks
Wordpress (Low)	(a) Which of the WordPress plans offers community support instead of email support?
	(b) What is the cheapest plan you can get that offers Email & Live Chat support?
WhatsApp (Low)	(a) Under frequently asked questions, what topic features in both the iPhone and Android columns?
	(b) Under frequently asked questions, which sections feature topics relating to notifications?
Outlook (Low)	(a) According to the text, is Twitter a partner app of Outlook?
	(b) The names of which apps are both mentioned in the text and presented as logos below the text?
Netflix (Low)	(a) Which is the cheapest plan that allows you to watch movies on your laptop, TV and tablet?
	(b) How much more would you have to pay comp. to the basic plan if you wanted to have Ultra HD?
YouTube (High)	(a) Under the American football category, which videos have been posted within the last three months?
	(b) Under the NBA topic, which video has the largest number of views?
Amazon (High)	(a) Which item has the largest price discount measured in percentage?
	(b) Which product has been rated by the largest number of users?
Adobe (High)	(a) Which is the product that is targeted to UX designers and for which students can get a discount?
	(b) How many types of clouds are offered by Adobe within this page?
BBC (High)	(a) According to the schedule, which Grand Prix takes place first: the Australia or the Bahrain?
	(b) Which of the following sports does not have its own tab on BBC Sport: Golf, Cricket or Volleyball?

TABLE III
CLASSIFIER SELECTION: COMPARISON BETWEEN ALGORITHMS
(ACCURACY AND 95% CONFIDENCE INTERVALS)

Algorithm	Search, page-specific AOIs	Browse (1), page-specific AOIs
Logistic Regression	0.70 (0.68, -0.72)	0.66 (0.64, -0.68)
Random Forest	0.65 (0.63,0.67)	0.63 (0.60,0.65)
SVM	0.55 (0.53,0.56)	0.63 (0.61,0.65)
NaiveBayes	0.51 (0.51,0.52)	0.55 (0.54,0.57)

TABLE IV
GAZE FEATURE RESULTS - BROWSE (STUDY 1) WITH 95% CONFIDENCE
INTERVALS (PAGE-SPECIFIC AOIS)

Page	Gaze Features	Gaze Features + AOI ID
Apple	.63 (.61-.66)	.47 (.46-.48)
Babylon	.54 (.52-.56)	.50 (.48-.52)
AVG	.59 (.57-.62)	.57 (.54-.60)
BBC	.45 (.42-.47)	.49 (.48-.50)
GoDaddy	.55 (.53-.58)	.47 (.46-.48)
Yahoo!	.52 (0.50-.55)	.52 (.50-.53)

TABLE V
CONFUSION MATRIX FOR THE FIRST BROWSE TASK BEST RESULT: ALL
GAZE FEATURES + SELECTED MEDIA (APPLE + AVG). THE NUMBER IS
CALCULATED THROUGH DIVIDING 500 (100 TEST TRIALS WITH FIVE
PARTICIPANTS PER GROUP) BY THE NUMBER OF CORRECTLY LABELLED
PARTICIPANTS FOR EACH CLASS.

	Control - Predicted	ASD - Predicted
Control - Actual	0.722	0.294
ASD - Actual	0.278	0.706

TABLE VI
RESULTS FOR INDIVIDUAL WEB PAGES FOR THE SEARCH TASK WITH 95%
CONFIDENCE INTERVALS (PAGE-SPECIFIC AOIS)

Page	Gaze Features	Gaze Features + AOI ID	Gaze + Correct Answer AOI
Apple	.69 (.67-.72)	.51 (.50-.52)	.69 (.67-.72)
Babylon	.63 (.60-.65)	.49 (.48-.50)	.61 (.58-.63
AVG	.39 (.37-.42)	.48 (.47-.50)	.43 (.41-.46)
BBC	.57 (.55-.59)	.50 (.50-.50)	.55 (.52-.57)
GoDaddy	.60 (.58-.63)	.48 (.47-.49)	.58 (.55-.60)
Yahoo!	.48 (.46-.50)	.50 (.49-.52)	.47 (.46-.49)

TABLE VII
CONFUSION MATRIX FOR THE SEARCH TASK BEST RESULT: ALL GAZE
FEATURES + SELECTED MEDIA (APPLE + BABYLON).

	Control - Predicted	ASD - Predicted
Control - Actual	0.698	0.192
ASD - Actual	0.302	0.808

TABLE VIII
RESULTS FOR GENDER AND VISUAL COMPLEXITY (ACCURACY AND 95% CONFIDENCE INTERVALS)

Feature set	Browse, Study 1 All	Best	Browse, Study 2 All	Best	Search, Study 1 All	Best	Synthesis, Study 2 All	Best
Page specific AOIs + Gender	.53 (.50,.56)	.65 (.62,.68) (AP, AVG)	.59 (.56,.61)	.66 (.64,.69) (AB, NF, OL, WA, WP, YT)	.51 (.49,.54)	.61 (.57,.64) (AP)	.58 (.56,.60)	.64 (.62,.66) (BBC, WP)
2 x 2 grid + Gender	.49 (.46,.51)	.69 (.66,.72) (AP, BL)	.62 (.60,.64)	.65 (.63,.67) (AB, WA, WP, YT)	.58 (.55,.60)	.57 (.54,.60) (BL, BBC)	.59 (.57,.61)	.62 (.59,.65) (AB, OL, YT)
4 x 4 grid + Gender	.60 (.57,.63)	.67 (.64,.69) (AVG, GD)	.63 (.60,.65)	.66 (.63,.68) (AB, BBC, NF, WA, WP, YT)	.53 (.50,.56)	.57 (.54,.59) (GD)	.6 (.58,.62)	.63 (.60,.65) (AB, AZ, BBC, OL, WA, YT)
Page specific AOIs + VC	.66 (.64,.68)	.75 (.73,.78) (AP, AVG)	.61 (.59,.63)	.61 (.59,.63) (AB, NF, OL)	.7 (.68,.72)	.76 (.74,.78) (AP, BL, AVG)	.61 (.58,.63)	.67 (.65,.69) (AB, AZ, OL)
2 x 2 grid + VC	.56 (.53,.58)	.70 (.68,.72) (AP, BL, AVG, GD)	.49 (.46,.51)	.60 (.58,.62) (BBC, WP, YT)	.56 (.53,.58)	.67 (.65,.70) (BL, BBC)	.63 (.61,.65)	.67 (.65,.69) (AZ, NF, OL)
4 x 4 grid + VC	.66 (.64,.68)	.71 (.69,.73) (AP, AVG)	.48 (.46,.49)	.60 (.58,.63) (OL, WA, YT)	.66 (.64,.68)	.73 (.71,.75) (AP, GD, YH)	.64 (.62,.66)	.72 (.70,.74) (AZ, OL)

Study 1–Apple: AP, Babylon: BL, AVG: AVG, Yahoo: YH, Godaddy: GD, BBC: BBC
Study 2–Adobe: AB, Amazon: AZ, BBC: BBC, Netflix: NF, Outlook: OL, WhatsApp: WA, WordPress: WP, YouTube: YT