CUED - Engineering Tripos Part IIB 2019-2020 **Module Coursework**

Module		Title of report	
Date submitted:		Assessment for this module is ☐ 100% / ☐ 25% coursework of which this assignment forms _____ %	

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Feedback to the student

☐ **See also comments in the text**

		Very good	**Good**	Needs improvmt
CONTENT	**Completeness, quantity of content:** Has the report covered all aspects of the lab? Has the analysis been carried out thoroughly?			
	Correctness, quality of content Is the data correct? Is the analysis of the data correct? Are the conclusions correct?			
	Depth of understanding, quality of discussion Does the report show a good technical understanding? Have all the relevant conclusions been drawn?			
	Comments:			
PRESENTATION	**Attention to detail, typesetting and typographical errors** Is the report free of typographical errors? Are the figures/tables/references presented professionally?			
	Comments:			

Overall assessment (circle grade)		A*	**A**	B	C	D
Guideline standard		>75%	**65-75%**	55-65%	40-55%	<40%
Penalty for lateness:		*20% of marks per week or part week that the work is late.*				

Marker: Date:

4F13 Probabilistic Machine Learning - True Skill Ranking

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Abstract

This report outlines the results of the second coursework for 4F13.

Contents

1 Questions

1.a Gibbs Sampling

Listing 1: Gibbs sampling additions

```
m = np.zeros((M, 1))
for p in range(M):
        # fill in m[p] prediction (natural param conditional)
        wins_array = np.array(G[:, 0] == p).astype(int)
        loss_array = np.array(G[:, 1] == p).astype(int)
        m[p] = np.dot(t[:,0], (wins_array - loss_array))

iS = np.zeros((M, M))  # Container for sum of precision matrices (likelihood terms)
for g in range(N):
        # Build the iS matrix
        winner = G[g, 0]
        loser = G[g, 1]

        iS[winner, winner] += 1
        iS[winner, loser] -= 1
        iS[loser, winner] -= 1
        iS[loser, loser] += 1
```

1.b EP - Message Passing

1.c EP - Top Four Head to Head

1.d Gibbs - Nadal v Djokovic

1.e Method Comparison: Win ratio, Gibbs and EP

Words: 987

$P(w_i > w_j)$	**Djokovic**	**Federer**	**Nadal**	**Murray**
Djokovic	-	0.92	0.95	0.98
Federer	0.08	-	0.59	0.79
Nadal	0.05	0.41	-	0.73
Murray	0.02	0.21	0.27	-

(a) Prob. row player is more skilful

$P(t_{ij} > 0)$	**Djokovic**	**Federer**	**Nadal**	**Murray**
Djokovic	-	0.64	0.66	0.71
Federer	0.36	-	0.52	0.58
Nadal	0.34	0.48	-	0.56
Murray	0.29	0.42	0.44	-

(b) Prob. row player wins a head-to-head

Table 1: Top four players comparison