# Results for the Bayesian method using $\alpha \neq 1$

Comparing to the results reported in Results of Bayesian approach for stage-1 of hierarchical recognition section of main track to the ones reported in this document, we can say that both in the hierarchical and non-hierarchical methods, using a high $\alpha$ value yields in general better results (at the cost of a slight decrease in identification of couples).

## Hierarchical stage-1

Using $C_{ij}^{be}$ as a decision criterion at stage-1 of the hierarchical approach, having a non-zero learning rate (i.e. $\alpha$) introduces an improvement in identification rates (see Table 3 of main track and Tables 1, 3). Moreover, we can see that similar to Table 5 of the main track, friends are still the category with the lowest recognition rate in Tables 2 and 4.

Table 1: Binary-by-event $C_{ij}^{be}$, hierarchical stage-1, $\alpha = 0.5$.

|  |  | Work | Leisure |
|---|---|---|---|
| Ground truth | Work | **74.02** | 25.98 |
|  | Leisure | 36.04 | **63.96** |

Table 2: Binary-by-event $C_{ij}^{be}$, hierarchical stage-1, $\alpha = 0.5$ with detailed confusion rates.

|  |  | Work | Leisure |
|---|---|---|---|
| Ground truth | Colleagues | **74.02** | 25.98 |
|  | Families | 27.08 | **72.92** |
|  | Couples | 24.57 | **75.43** |
|  | Friends | 46.23 | **53.77** |

Table 3: Binary-by-event $C_{ij}^{be}$, hierarchical stage-1, $\alpha = 0$ (in %).

|  |  | Work | Leisure |
|---|---|---|---|
| Ground truth | Work | **70.51** | 29.49 |
|  | Leisure | 36.88 | **63.12** |

Table 4: Binary-by-event $C_{ij}^{be}$, hierarchical stage-1, $\alpha = 0$ (in %) with detailed confusion rates.

| | | Work | Leisure |
|---|---|---|---|
| Ground truth | Colleagues | **70.51** | 29.49 |
| | Families | 28.83 | **71.17** |
| | Couples | 27.13 | **72.87** |
| | Friends | 45.83 | **54.17** |

## Hierarchical stage-2

Using $C_{ij}^{be}$ in stage-2, friends are detected with an improved rate regardless of the $\alpha$ value, since colleagues are discarded in stage-1. Having a learning rate of $\alpha = 1$ seems to degrade the detection rate of couples, while it helps to better identify families and friends (see Table 7 of main track and and Tables 5, 6).

Table 5: Binary-by-event $C_{ij}^{be}$, hierarchical stage-2, $\alpha = 0.5$ (in %).

| | | Families | Couples | Friends |
|---|---|---|---|---|
| Ground truth | Families | 32.07 | 32.16 | **35.76** |
| | Couples | 20.10 | **48.39** | 31.51 |
| | Friends | 16.17 | 22.34 | **61.49** |

Table 6: Binary-by-event $C_{ij}^{be}$, hierarchical stage-2, $\alpha = 0$ (in %).

| | | Families | Couples | Friends |
|---|---|---|---|---|
| Ground truth | Families | 31.59 | 30.97 | **37.16** |
| | Couples | 21.15 | **47.44** | 31.42 |
| | Friends | 17.71 | 25.17 | **57.41** |

## Non-Hierarchical

In the non-hierarchical approach with $C_{ij}^{be}$, the overall identification rates seem to profit from a higher learning rate (see Table 9 of main track and and Tables 7, 8). In particular, $\alpha = 1$ attains, between the tested values, maximum recognition values on the diagonal. This shows the importance of using previous detection results to modify the priors. It

may be expected that the best recognition rates are attained for $0.5 < \alpha < 1$, although this optimization problem is left for future work.

Table 7: Binary-by-event $C_{ij}^{be}$, non-hierarchical, $\alpha = 0.5$ (in %).

|  |  | Colleagues | Families | Couples | Friends |
|---|---|---|---|---|---|
| Ground truth | Colleagues | **65.78** | 7.55 | 11.46 | 15.21 |
|  | Families | 20.12 | 29.11 | **31.11** | 19.65 |
|  | Couples | 18.71 | 17.34 | **47.75** | 16.20 |
|  | Friends | **37.67** | 13.07 | 21.35 | 27.91 |

Table 8: Binary-by-event $C_{ij}^{be}$, non-hierarchical, $\alpha = 0$ (in %).

|  |  | Colleagues | Families | Couples | Friends |
|---|---|---|---|---|---|
| Ground truth | Colleagues | **59.67** | 8.42 | 13.80 | 18.11 |
|  | Families | 20.46 | 27.58 | **30.69** | 21.26 |
|  | Couples | 19.27 | 17.75 | **45.25** | 17.72 |
|  | Friends | **36.22** | 13.23 | 22.05 | 28.50 |