Evaluation – CHC Use Case

CHC Evaluation

- Dataset:
  - Confirmation/Approval required from PRAKSIS
  - **Unsupervised, as of now**
  - Consists of **5 examples**
  - Each **example** consists of **15, 20, 25, 50 and 100 TCN profiles**
  - Each **TCN profile** consists of the following attributes and their domain:
    - **Age –** *[18,120]*
    - **Gender** – *{Male, Female, Other}*
    - **Family** – *{Single Man/Woman, Nuclear, Single Parent Mother/Father, Extended}*
    - **Nationality** – *{<nationality>}*
    - **Religion –** *{<religion>}*
    - **Ethnicity –** *{<ethnicity>}*
    - **Age preference –** *{Don't mind, 18-25, 26-33, 34-43, 44-50, 51-65, 65-120}*
    - **Gender preference** – *{Male, Female, Other, Don't mind}*
    - **Family preference –** *{Single Man/Woman, Nuclear, Single Parent Mother/Father, Extended, Don't mind}*
    - **Nationality preference** – *{Same, Mixed, Don't mind}*
    - **Religion preference** – *{Same, Mixed, Don't mind}*
    - **Ethnicity preference** – *{Same, Mixed, Don't mind}*
    - **Location preference** – *{Don't mind, Ampelokipoi, Menemeni, Kalamaria, Eleftherio-Kordelio, Evosmos, Agios Pavlos, Neapoli, Pefka, Sykies, Nea Efkarpia, Polichni, Stavroupoli, Pylaia, Thessaloniki, Triandria}*
    - **Accessibility preference** – *{Don't mind, Yes, No}*
    - **Rent Period preference** – *{Don't mind, [<date_from>, <date_to>]}*
    - **Share with preference** – *{Don't mind, [<number_minimum>, <number_maximum>]}*

How Preferences are Computed?

Age Preference:

- Possible values are *{Don't mind, 18-25, 26-33, 34-43, 44-50, 51-65, 65-120}*
- TCNs can select either "Don't mind" or at least one age range.
- For example, **TCN1_Age_Preference** = *18-25, 26-33* -> this means TCN1 prefers people whose ages are in these range. If TCN2 is 27 years old, TCN1 **will like** TCN2. If TCN3 is 34 years old, TCN1 **will not like** TCN3.
- If **TCN1_Age_Preference** = *Don't mind*, TCN1 will like everyone regardless of their age.

Gender Preference:

- Possible values are *{Don't mind, Male, Female, Other}*
- TCNs can select only one of the possible values shown above.
- For example, **TCN1_Gender_Preference** = *Male* -> this means TCN1 prefers people who are Male.
- If **TCN1_Gender_Preference** = *Don't mind*, TCN1 will like everyone regardless of their gender.

Family Preference:

- Possible values are *{Don't mind, Single Man/Woman, Nuclear, Single Parent Mother/Father, Extended}*
- TCNs can select either "Don't mind" or at least one family type.
- For example, **TCN1_Family_Preference** = *Single Man, Nuclear* -> this means TCN1 prefers people whose family types are either Single Man or Nuclear.
- If **TCN1_Family_Preference** = *Don't mind*, TCN1 will like everyone regardless of their family type.

How Preferences are Computed?

Nationality Preference (works same as Religion and Ethnicity Preferences):

- Possible values are *{Don't mind, Same, Mixed}*
- TCNs can select only one of the possible values shown above.
- For example, **TCN1_Nationality_Preference** = *Same* -> this means TCN1 prefers people whose nationalities are same with his/her own nationality. If TCN1 and TCN2 are Arabic, then TCN1 **will like** TCN2. If TCN3 is Syrian, then TCN1 **will not like** TCN3.
- If **TCN1_Nationality_Preference** = *Don't mind*, TCN1 will like everyone regardless of their nationality.

Religion Preference (works same as Nationality and Ethnicity Preferences):

- Possible values are *{Don't mind, Same, Mixed}*
- TCNs can select only one of the possible values shown above.
- For example, **TCN1_Religion_Preference** = *Same* -> this means TCN1 prefers people whose religions are same with his/her own religion. If TCN1 and TCN2 are "religion_1", then TCN1 **will like** TCN2. If TCN3 is "religion_2", then TCN1 **will not like** TCN3.
- If **TCN1_Religion_Preference** = *Don't mind*, TCN1 will like everyone regardless of their religion.

Ethnicity Preference (works same as Nationality and Religion Preferences):

- Possible values are *{Don't mind, Same, Mixed}*
- TCNs can select only one of the possible values shown above.
- For example, **TCN1_Ethnicity_Preference** = *Mixed* -> this means TCN1 prefers people whose ethnicities are different than his/her own ethnicity. If TCN1 and TCN2 are "ethnicity_1", then TCN1 **will not like** TCN2. If TCN3 is "ethnicity_2", then TCN1 **will like** TCN3.
- If **TCN1_Ethnicity_Preference** = *Don't mind*, TCN1 will like everyone regardless of their ethnicity.

How Preferences are Computed?

Location Preference:

- Possible values are *{Don't mind, Ampelokipoi, Menemeni, Kalamaria, Eleftherio-Kordelio, Evosmos, Agios Pavlos, Neapoli, Pefka, Sykies, Nea Efkarpia, Polichni, Stavroupoli, Pylaia, Thessaloniki, Triandria}*
- TCNs can select either "Don't mind" or at least one Location.
- Just for the simplicity for testing, the locations are shown as L1, L2, …. In the Welcome application, the actual locations will be used.
- For example, **TCN1_Location_Preference** = *L1, L7* -> this means TCN1 prefers people who also prefer to live in either L1 or L7. If TCN2 prefers to live in L7, then TCN1 **will like** TCN2. If TCN3 prefers to live in L4, then TCN1 **will not like** TCN3.
- If **TCN1_Location_Preference** = *Don't mind*, TCN1 will like everyone regardless of their location preference.

Accessibility Preference:

- Possible values are *{Don't mind, Yes, No}*
- TCNs can select only one of the possible values shown above.
- For example, **TCN1_Accessibility_Preference** = *Yes* -> this means TCN1 prefers people who also prefer to have accessibility service available. If TCN1 and TCN2 prefers Yes for their accessibility preferences, then TCN1 **will like** TCN2. If TCN3 prefers No, then TCN1 **will not like** TCN3. If TCN4 prefers Don't mind, then TCN1 **will like** TCN4.
- If **TCN1_Accessibility_Preference** = *Don't mind*, TCN1 will like everyone regardless of their accessibility preferences.

How Preferences are Computed?

Rent Period Preference:

- Possible values are *{Don't mind, [<date_from>, <date_to>]}*
- TCNs can select either "Don't mind" or a period such as from 15/03/2021 to 15/09/2021.
- TCNs will be similar as much as they have a rent period in common. For example, if two TCNs prefer the exact same period, then they will be perfectly similar in terms of Rent preference. If two TCNs have zero common period, then they will not be a match. Shortly, the more rent period two TCNs have in common, the more similar they will be.
- For example, **TCN1_Rent_Preference** = [15/03/2021 - 15/09/2021] -> this means TCN1 prefers people who also prefer to rent apartment for his/her specified period. **TCN2_Rent_Preference** = [15/03/2021 - 15/09/2021] and **TCN3_Rent_Preference** = [15/03/2021 - 15/06/2021]. TCN1 and TCN2 will be a perfect match but TCN1 and TCN3 will be similar as well since they have a common rent period (from 15/03/2021 to 15/06/2021).
- If **TCN1_Rent_Preference** = *Don't mind*, TCN1 will like everyone regardless of their rent preference.

Share With Preference (works same as Rent Period Preference but here TCNs select numbers instead of dates):

- Possible values are *{Don't mind, [<number_minimum>, <number_maximum>]}*
- TCNs can select either "Don't mind" or a period such as from 2 to 4.
- TCNs will be similar as much as they have a range in common. For example, if two TCNs prefer the exact same range, then they will be perfectly similar in terms of SahreWith preference. If two TCNs have zero common period, then they will not be a match. Shortly, the more range two TCNs have in common, the more similar they will be.
- For example, **TCN1_ShareWith_Preference** = [2-4] -> this means TCN1 prefers people who also prefer to share the apartment with his/her specified amount of people. **TCN2_ShareWith_Preference** = [2-4] and **TCN3_ShareWith_Preference** = [1-2]. TCN1 and TCN2 will be a perfect match but TCN1 and TCN3 will be similar as well since they have a common range (from 1 to 2).
- If **TCN1_ShareWith_Preference** = *Don't mind*, TCN1 will like everyone regardless of their rent preference.

CHC Weights

Weights of Preferences
Age Preference: 10
Gender Preference: 9
Family Preference: 5
Nationality Preference: 8
Religion Preference: 6
Ethnicity Preference: 7
Location Preference: 2
Accessibility Preference: 3
Rent Period Preference: 1
Share With Preference: 4

CHC Weights

Weights of Preferences
Age Preference: 10
Gender Preference: 9
Family Preference: 5
Nationality Preference: 8
Religion Preference: 6
Ethnicity Preference: 7
Location Preference: 2
Accessibility Preference: 3
Rent Period Preference: 1
Share With Preference: 4

Weights of Preferences
Age Preference: 10 -> 18%
Gender Preference: 9 -> 16%
Family Preference: 5 -> 9%
Nationality Preference: 8 -> 15%
Religion Preference: 6 -> 11%
Ethnicity Preference: 7 -> 13%
Location Preference: 2 -> 4%
Accessibility Preference: 3 -> 5%
Rent Period Preference: 1 -> 2%
Share With Preference: 4 -> 7%

Weights of Preferences: default importance specified by PRAKSIS
Age Preference: 10
Gender Preference: 9
Family Preference: 5
Nationality Preference: 8
Religion Preference: 6
Ethnicity Preference: 7
Location Preference: 2
Accessibility Preference: 3
Rent Period Preference: 1
Share With Preference: 4

Weights of Preferences: apartment preferences are not important. Age, Gender and nationality are specifically important.
Age Preference: 10 -> 18%
Gender Preference: 10 -> 18%
Family Preference: 3 -> 5%
Nationality Preference: 10 -> 18%
Religion Preference: 8 -> 15%
Ethnicity Preference: 9 -> 16%
Location Preference: 1 -> 2%
Accessibility Preference: 1 -> 2%
Rent Period Preference: 1 -> 2%
Share With Preference: 2 -> 4%

Weights of Preferences: apartment preferences are more important.
Age Preference: 4 -> 7%
Gender Preference: 7-> 13%
Family Preference: 5 -> 9%
Nationality Preference: 7 -> 13%
Religion Preference: 7 -> 13%
Ethnicity Preference: 5 -> 9%
Location Preference: 4 -> 7%
Accessibility Preference: 7 -> 13%
Rent Period Preference: 4 -> 7%
Share With Preference: 5 -> 9%

CHC Evaluation

Performance Measures:

1. As of now, **no ground truth** available
    1. **Customer Satisfaction Score** (CSAT) on a Likert scale since system already provides the exact solution. Authors evaluate the BOSS algorithm by comparing its execution time to other exact algorithms such as ODP-IP and ODSS.
        1. We provide the results for the given/approved dataset
        2. Users evaluate the results on a **Likert scale** (5: *Very Satisfied*, 4: *Satisfied*, 3: *Neither Satisfied nor Dissatisfied*, 2: *Dissatisfied*, 1: *Very Dissatisfied)*
        3. In case the **results are not satisfactory**, we try to improve the results based **on users' feedback**. i.e. to be answered by users:
            1. *What makes the results unsatisfactory?*
            2. *How much does it take to compute such results manually? …*
    2. **Silhouette Score** to compute the separation distance between the clusters. Range: [-1,1] where higher score is desired since it means there are small intra-cluster and large inter-cluster average distances.
        1. Nothing is required from users to compute **Silhouette Score**

2. If **ground truth** is **provided**:
    1. **Purity** to compute similarity of two clustering/CS results. Range: [0,1] where 1 means **perfect** match, 0 means **worst** match
    2. **Normalized Mutual Information** (NMI) to compute how much information is shared between a clustering and ground-truth.

        1. Users provide **multiple different examples** and for each of them, they prepare **intuitive grouping results**
        2. We compute the results for the provided examples
        3. We compute **Purity** and **NMI** by comparing **intuitive results vs agents' results**
        4. In case the results for the same example dataset are **not very similar**, we provide the results to users to compute **CSAT (step 1.1.1)**
        5. **Continue step 1.1.2**

CHC Example_1 → 15 Agents
Results

***** Not guaranteed that all TCNs will be in a group. Possible that some TCNs can't find a potential group mate because their personal and preferences wouldn't match with others.

- **Singleton**: TCNs who don't match with others.
- **Likert scale:** (5: Very Satisfied, 4: Satisfied, 3: Neither Satisfied nor Dissatisfied, 2: Dissatisfied, 1: Very Dissatisfied)

Solution	Evaluation (Likert scale)
Singleton: [8, 1, 4, 11] --> 4	**5** - Taking into account the preferences and their weights (please see the comment on slide 1), these four TCNs don't match with the others.
Group1: [7, 14] --> 2	**3** - Taking into account the weights of preferences (please see the comment on slide 1), the age preference (most important) doesn't match. Secondly, the family preference doesn't match for both of them. TCN with ID 7 prefers extended or nuclear families and TCN with id 14 is a single man. Finally, less important preferences such as location preference, rental period don't match.
Group2: [9, 10, 12, 15] --> 4	**4** - Taking into account the weights of preferences (please see the comment on slide 1), the results are satisfactory as the most important preferences (age, gender, nationality) match among the TCNs. We select number 4 from Likert scale instead of 5 because other important preferences, such as family, ethnicity and religion preference, don't match for all grouped TCNs. For example, concerning family preferences, TCN with id 10 matches with TCN (id) 9 and 12, but TCNs (id) 9 and 15 don't match with the others as they prefer extended of single parent mother families that are not exist in this group. Likewise for ethnicity and religion preferences. Finally, less important preferences such as location preference, etc. don't match for all of them.
Group3: [2, 13] --> 2	**4** - Taking into account the weights of preferences (please see the comment on slide 1), the results are satisfactory as the majority of the important preferences (age, nationality, religion, ethnicity) match between the TCNs. We select number 4 from Likert scale instead of 5 because other important preferences, such as gender and family preference, don't match for the grouped TCNs. Finally, less important preferences such as location, rental period and shrwth preference, etc. don't match for both of them.
Group4: [3, 5, 6] --> 3	**4** - Taking into account the weights of preferences (please see the comment on slide 1), the results are satisfactory as the majority of the most important preferences (age, nationality, ethnicity, religion preference) match among the TCNs. We select number 4 from Likert scale instead of 5 because other important preferences, such as gender and family don't match for all grouped TCNs. Finally, less important preferences such as shrwth preference, etc. don't match for both of them.

CHC Example_1 → 15 Agents

Results

***** Not guaranteed that all TCNs will be in a group. Possible that some TCNs can't find a potential group mate because their personal and preferences wouldn't match with others.

- **Singleton**: TCNs who don't match with others.
- **Likert scale:** (5: Very Satisfied, 4: Satisfied, 3: Neither Satisfied nor Dissatisfied, 2: Dissatisfied, 1: Very Dissatisfied)

Solution	Evaluation (Likert scale)
Singleton: [8, 1, 4, 11] --> 4	**5** - Taking into account the preferences and their weights (please see the comment on slide 1), these four TCNs don't match with the others.
Group1: [7, 14] --> 2	**3** – 18/2 + 16 + 0 + 15 + 11 + 13 + 0 + 5 + 2 * 5/22 + 7*1/6 = 70
Group2: [9, 10, 12, 15] --> 4	**4** – 18 + 16*5/12 + 9*2/12 + 15 + 11*2/4 + 13*2/4 + 0 + 5*8/12 + 0,2 + 7*9/12 = 62
Group3: [2, 13] --> 2	**4** – 18 + 16/2 + 9 + 15 + 11 + 13 + 0 + 5 + 2 * 12/18 + 0 = 80
Group4: [3, 5, 6] --> 3	**4** – 18*3/6 + 16*1/6 + 9*3/6 + 15 + 11 + 13*4/6 + 4 * ¾ + 5 + 2*2/6 + 7*4/6 = 59

CHC Example_2 → 20 Agents
Results

Solution	Evaluation (Likert scale)
Singleton: [2, 5, 6, 9, 10, 20] --> 6	**4** - Taking into account the preferences and their weights (please see the comment on slide 1), four of the TCNs don't match with the others. But TCN with id 10 can match with TCN with id 20 (except age, location and shrwth preference, all the other preferences can match).
Group1: [1, 16] --> 2	**4 -** Taking into account the weights of preferences (please see the comment on slide 1), the results are satisfactory as enough preferences (age, nationality, location, accessibility, rent period, shrwth) match between the TCNs. We select number 4 from Likert scale instead of 5 because other important preferences, such as gender and family preference, don't match for the grouped TCNs. For example, concerning family preferences, TCN with id 16 matches with TCN (id) 1, but TCN 1 doesn't match with TCN (id) 1 as prefers single woman/single parent mother.
Group2: [15, 17,] --> 2	**4** - Taking into account the weights of preferences (please see the comment on slide 1), the results are satisfactory as the enough preferences (gender, nationality, ethnicity, accessibility, shrwth) match between the TCNs. We select number 4 from Likert scale instead of 5 because other important preferences, such as age, family, and religion preference, don't match for the grouped TCNs. For example, concerning age preferences, TCN with id 17 matches with TCN (id) 15, but TCNs 15 don't belong to TCNs' 17 preferable age group. Likewise for family and religion preferences. Finally, less important preferences such as location and rental period preference, etc. don't match for both of them.
Group3: [3, 7, 8, 12, 13, 19, 4, 11, 14, 18] --> 10	**4** - Taking into account the weights of preferences (please see the comment on slide 1), the most of the important preferences doesn't match among all grouped TCNs. Maybe the 10 TCNs can be splitted in smaller groups.

CHC Example_3 → 25 Agents
Results

Solution	Evaluation (Likert scale)
Singleton: [3, 5, 6, 7, 9, 10, 13, 19, 1, 11, 14, 18, 20, 21, 23,] --> 15	**5** - Taking into account the preferences and their weights (please see the comment on slide 1), these 15 TCNs don't match with the others.
Group1: [15, 24,] --> 2	**4 -** Taking into account the weights of preferences (please see the comment on slide 1), the results are satisfactory as enough preferences (age, gender, family, ethnicity, location, accessibility, shrwth) match between the TCNs. We select number 4 from Likert scale instead of 5 because other important preferences, such as nationality and religion, don't match for the grouped TCNs. For example, concerning nationality preferences, TCN with id 15 matches with TCN (id) 24, but TCN 24 doesn't match with TCN (id) 15 as prefers the same nationality. Likewise for religion preference. Finally, less important preferences such as rental period preference deviates between them.
Group2: [2, 8, 17, 16, 25,] --> 5	**4** - Taking into account the weights of preferences (please see the comment on slide 1), the results are satisfactory as most of the preferences (age, gender, nationality, religion, accessibility, shrwth) match among the TCNs. We select number 4 from Likert scale instead of 5 because other important preferences, such as ethnicity preference doesn't match for one TCN (id 8). Finally, less important preferences such as location and rental period preference, etc. don't match for all of them.
Group3: [12, 22, 4,] --> 3	**4** - Taking into account the weights of preferences (please see the comment on slide 1), the results are satisfactory as the most preferences (age, nationality, ethnicity, location, accessibility, shrwth) match among the TCNs. We select number 4 from Likert scale instead of 5 because other important preferences, such as gender, family, and religion preference don't match for the all grouped TCNs. For example, concerning gender preferences, TCN with id 12 doesn't match with TCN (id) 4 and 22, as the gender preference is male (no males included in this group). Likewise for family and religion preferences. Finally, less important preferences such as rental period preference, etc. don't match for all of them.

CHC Example_4 → 50 Agents
Results

Solution	Evaluation (Likert scale)
Singleton: [2, 3, 5, 7, 8, 10, 12, 13, 17, 19, 29, 35, 42, 44, 47, 1, 4, 14, 18, 20, 21, 23, 36, 40, 41, 43, 45, 50,] --> 28	**5** - Taking into account the preferences and their weights (please see the comment on slide 1), these 15 TCNs don't match with the others.
Group1: [6, 11, 25, 46,] --> 4	**4** - Taking into account the weights of preferences (please see the comment on slide 1), the results are satisfactory as most of the preferences (age, gender, family, nationality, accessibility, shrwth) match among the TCNs. We select number 4 from Likert scale instead of 5 because other preferences, such as religion and ethnicity preference doesn't match for all of them. For example, TCN (id 6,25 prefer same religion and but the other TCNs have different values. Likewise for the ethnicity, which) doesn't match for one TCN (id 46). Finally, less important preferences such as location and rental period preference, etc. don't match for all of them.
Group2: [9, 24, 38,] --> 3	**4** - Taking into account the weights of preferences (please see the comment on slide 1), the results are satisfactory as most of the preferences (gender, family, religion, ethnicity, location, accessibility, rent period, shrwth) match among the TCNs. We select number 4 from Likert scale instead of 5 because other preferences, such as religion and nationality preference doesn't match for all of them. TCN (id)38 and TCN (id) 9 prefers same nationality and religion respectively, but there is not an available option in this group.
Group3: [28, 39,] --> 2	**3** - Taking into account the weights of preferences (please see the comment on slide 1), the age, gender and family preferences (most important) don't match. Finally, less important preferences such as rental period and shrwth don't match.
Group4: [15, 49,] --> 2	**4** - Taking into account the weights of preferences (please see the comment on slide 1), the results are satisfactory as most of the preferences (age, gender, family, ethnicity, location, accessibility, shrwth) match among the TCNs. We select number 4 from Likert scale instead of 5 because other preferences, such as age and nationality preference) doesn't match for both of them. Finally, less important preferences such as rental period preference, etc. don't match for both of them.

CHC Example_4 → 50 Agents
Results

Solution	Evaluation (Likert scale)
Group5: [27, 37, 16,] --> 3	**4** - Taking into account the weights of preferences (please see the comment on slide 1), the results are satisfactory as the majority of the preferences (age, gender, family, nationality, religion, ethnicity, rent period) match among the TCNs. We select number 4 from Likert scale instead of 5 because other preferences, such as location, accessibility and shrwth preference don't match for all of them.
Group6: [30, 32, 31,] --> 3	**4** - Taking into account the weights of preferences (please see the comment on slide 1), the results are satisfactory as the majority of the preferences (age, gender, family, nationality, religion, ethnicity, location, accessibility, shrwth) match among the TCNs. We select number 4 from Likert scale instead of 5 because other preferences, such as rent period preference don't match exactly.
Group7: [26, 34,] --> 2	**5** - Taking into account the preferences and their weights (please see the comment on slide 1), these 2 TCNs has in common all the preferences.
Group8: [22, 33, 48,] --> 3	**4** - Taking into account the weights of preferences (please see the comment on slide 1), the results are satisfactory as the majority of the preferences (age, gender, family, nationality, ethnicity, location, accessibility, shrwth) match among the TCNs. We select number 4 from Likert scale instead of 5 because other preferences, such as religion and rent period preference don't match exactly.

CHC Example_5 → 100 Agents
Results

Solution	Evaluation (Likert scale)
Singleton: [1, 3, 4, 5, 6, 7, 8, 11, 13, 14, 15, 17, 19, 20, 21, 22, 23, 25, 27, 28, 30, 33, 34, 35, 38, 41, 42, 43, 44, 45, 47, 48, 49, 50, 52, 53, 54, 55, 56, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 72, 73, 74, 75, 77, 78, 79, 80, 81, 82, 83, 84, 85, 89, 95, 96, 100,] → 68	**5** - Taking into account the preferences and their weights (please see the comment on slide 1), these 15 TCNs don't match with the others.
Group1: [16, 31] → 2	**4** - Taking into account the weights of preferences (please see the comment on slide 1), the results are satisfactory as enough preferences (age, nationality, ethnicity, location, accessibility, rent period, shrwth) match between the TCNs. We select number 4 from Likert scale instead of 5 because other preferences, such as gender, family and religion preference don't match for both of them.
Group2: [24, 46] → 2	**4** - Taking into account the weights of preferences (please see the comment on slide 1), the results are satisfactory as enough preferences (age, gender, nationality, religion, ethnicity, accessibility, shrwth) match between the TCNs. We select number 4 from Likert scale instead of 5 because other preferences, such as family, location and rent period preference don't match for both of them.
Group3: [10, 12] → 2	**4** - Taking into account the weights of preferences (please see the comment on slide 1), the results are satisfactory as enough preferences (age, gender, family, nationality, ethnicity, accessibility, shrwth) match between the TCNs. We select number 4 from Likert scale instead of 5 because other preferences, such as religion, location and rent period preference don't match for both of them.
Group4: [9, 18] → 2	**4** - Taking into account the weights of preferences (please see the comment on slide 1), the results are satisfactory as the most preferences (age, gender, family, nationality, religion, ethnicity, accessibility, shrwth) match between the TCNs. We select number 4 from Likert scale instead of 5 because other preferences, such as location and rent period preference don't match for both of them.

CHC Example_5 → 100 Agents
Results

Solution	Evaluation (Likert scale)
Singleton: [1, 3, 4, 5, 6, 7, 8, 11, 13, 14, 15, 17, 19, 20, 21, 22, 23, 25, 27, 28, 30, 33, 34, 35, 38, 41, 42, 43, 44, 45, 47, 48, 49, 50, 52, 53, 54, 55, 56, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 72, 73, 74, 75, 77, 78, 79, 80, 81, 82, 83, 84, 85, 89, 95, 96, 100,] → 68	**5** - Taking into account the preferences and their weights (please see the comment on slide 1), these 15 TCNs don't match with the others.
Group1: [16, 31] → 2	**4** – 18 + 0 + 9/2 + 15 + 11/2 + 13 + 4 + 5 + 2 + 7 = 73
Group2: [24, 46] → 2	**4** – 18 + 16 + 9/2 + 15 + 11 + 13 + 0 + 5 + 1,2 + 0 = 83,7
Group3: [10, 12] → 2	**4** - Taking into account the weights of preferences (please see the comment on slide 1), the results are satisfactory as enough preferences (age, gender, family, nationality, ethnicity, accessibility, shrwth) match between the TCNs. We select number 4 from Likert scale instead of 5 because other preferences, such as religion, location and rent period preference don't match for both of them.
Group4: [9, 18] → 2	**4** - Taking into account the weights of preferences (please see the comment on slide 1), the results are satisfactory as the most preferences (age, gender, family, nationality, religion, ethnicity, accessibility, shrwth) match between the TCNs. We select number 4 from Likert scale instead of 5 because other preferences, such as location and rent period preference don't match for both of them.

CHC Example_5 → 100 Agents
Results

Solution	Evaluation (Likert scale)
Group5: [36, 71] → 2	**4** - Taking into account the weights of preferences (please see the comment on slide 1), the results are satisfactory as enough preferences (age, gender, family, nationality, accessibility, shrwth) match between the TCNs. We select number 4 from Likert scale instead of 5 because other preferences, such as religion, ethnicity, location and rent period preference don't match for both of them.
Group6: [29, 40] → 2	**4** - Taking into account the weights of preferences (please see the comment on slide 1), the results are satisfactory as enough preferences (age, gender, religion, ethnicity, accessibility, shrwth) match between the TCNs. We select number 4 from Likert scale instead of 5 because other preferences, such as family, nationality, location and rent period preference don't match for both of them.
Group7: [58, 93] → 2	**4** - Taking into account the weights of preferences (please see the comment on slide 1), the results are satisfactory as enough preferences (gender, family, nationality, religion, ethnicity, location, accessibility, shrwth) match between the TCNs. We select number 4 from Likert scale instead of 5 because other preferences, such as age and rent period preference don't match for both of them.
Group8: [26, 98] → 2	**5** - Taking into account the preferences and their weights (please see the comment on slide 1), these 2 TCNs has in common all the preferences.
Group9: [2, 88, 99] → 3	**4** - Taking into account the weights of preferences (please see the comment on slide 1), the results are satisfactory as enough preferences (age, gender, family, nationality, religion, ethnicity, accessibility, shrwth) match between the TCNs. We select number 4 from Likert scale instead of 5 because other preferences, such as location and rent period preference don't match for all of them.
Group10: [39, 57] → 2	**4** - Taking into account the weights of preferences (please see the comment on slide 1), the results are satisfactory as enough preferences (age, gender, nationality, religion, ethnicity, location, accessibility, shrwth) match between the TCNs. We select number 4 from Likert scale instead of 5 because other preferences, such as family and rent period preference don't match for both of them.

CHC Example_5 → 100 Agents
Results

Solution	Evaluation (Likert scale)
Group11: [32, 37, 51, 76, 86, 87, 94, 97] → 8	**4** - Taking into account the weights of preferences (please see the comment on slide 1), the most of the important preferences doesn't match among all grouped TCNs. Maybe the 10 TCNs can be splitted in smaller groups.
Group12: [90, 91, 92,] → 3	**4** - Taking into account the weights of preferences (please see the comment on slide 1), the results are satisfactory as enough preferences (age, gender, family, nationality, religion, ethnicity, location, accessibility, shrwth) match between the TCNs. We select number 4 from Likert scale instead of 5 because other preferences, such as rent period preference don't match for all of them.