General

ID[1]		
Use case name	AI Ideally Matches Children to Daycare Centers	
Application domain	Public sector	
Deployment model	On-premise systems	
Status	In operation	
Scope[2]	Assignment pattern that satisfies complex applicants' requirements	
Objective(s)	To determine the assignment pattern that will fulfill the preferences of as many applicants as possible automatically.	
Narrative	Short description (not more than 150 words)	This AI technology automatically determines the assignment pattern while fulfilling as many applicants' preferences as possible by priority ranking by using game theory.
	Complete description	The number of children on daycare center waiting lists has become a social issue. Matching children to daycare centers while accommodating each family's preferences is time- and labor-intensive for local governments. The basic goal of daycare admissions screening is to satisfy the preferences of applicants according to the priority ranking of children in consideration of the number of places in each daycare center. In addition, each local government can incorporate more complex requirements, such as applicants who want their siblings assigned to the same daycare center and who want siblings assigned in the same period, in order to increase the satisfaction of applicants. Saitama city government has eight requirements concerning sibling admissions as well as the timing of the siblings’ admissions. The screening rule thus became more complex, and consequently there are cases where multiple assignment patterns can fulfill the rule or no patterns fulfill the rule. This means the city officials are required to take a long time to carefully determine the assignment of applicants to be absolutely sure that the relevant rules have been correctly fulfilled. This AI technology has made it possible to match children to daycare centers, meeting as many preferences as possible, following a priority ranking. This is done by modeling the dependency relationships of complex requirements, including parents who prioritize siblings going to the same daycare center, or parents who do not mind if their children go to different daycare centers as long as both children get a seat, using a mathematical model based on game theory, which rationally resolves the relationships between people having differing values. When this technology was evaluated using anonymized data from about 8,000 children in the city of Saitama, it successfully calculated an optimal assignment result in just a few seconds.
Stakeholders[3]	City officials, Daycare centers, Applicants	
Stakeholders’ assets, values[4]	Maintaining fairness of matching results, Reducing the burden of seat assignment tasks, Leading to return women to the workplace smoothly.	
System’s threats and vulnerabilities[5]		

Key performance indicators (KPIs)	ID	Name	Description	Reference to mentioned use case objectives
	1	Accuracy	The matching rate of assignment	Automatic assignment
	2	Time	The computation time to find an optimal assignment	Time reduction
AI features	Task(s)	Optimization		
	Method(s)[6]	Game theory		
	Hardware[7]			
	Topology[8]			
	Terms and concepts used[9]	Game theory, Matching theory		
Standardization opportunities/ requirements	Need to consider unique requirements for assignment rules in each local government.			
Challenges and issues	Challenges: Determine an optimal assignment pattern instantly and fairly depending on unique and complex rules in each local government. Issues: Long calculation time is required in the case of a large number of children and siblings			
Societal concerns	Description	Supporting working women Resolving the problem of children waiting for day care		
	SDGs[10]	Decent work and economic growth		

Data (optional)

Data characteristics	
Description	
Source[11]	
Type[12]	
Volume (size)	
Velocity (e.g. real time)[13]	
Variety (multiple datasets)[14]	
Variability (rate of change)[15]	
Quality[16]	

Process scenario (optional)

Scenario conditions					
No.	Scenario name	Scenario description	Triggering event	Pre-condition[17]	Post-condition[18]

Training (optional)

Scenario name	Training				
Step No.	Event[19]	Name of process/Activity[20]	Primary actor	Description of process/activity	Requirement

Specification of training data[21]	

Evaluation (optional)

Scenario name	Evaluation				
Step No.	Event[22]	Name of process/Activity[23]	Primary actor	Description of process/activity	Requirement

Input of evaluation[24]	
Output of evaluation[25]	

Execution (optional)

Scenario name	Execution				
Step No.	Event[26]	Name of process/Activity[27]	Primary actor	Description of process/activity	Requirement

Input of Execution[28]	
Output of Execution[29]	

Retraining (optional)

Scenario name	Retraining				
Step No.	Event[30]	Name of process/Activity[31]	Primary actor	Description of process/activity	Requirement

Specification of retraining data[32]	

References

References						
No.	Type	Reference	Status	Impact on use case	Originator/organization	Link

(Examples of other citation that cannot be described in the table format)

[1] Lominandze, DG. *Cyclotron waves in plasma*. Translated by AN. Dellis; edited by SM. Hamberger. 1st ed. Oxford : Pergamon Press, 1981. 206 p. International series in natural philosophy. Translation of: Ciklotronnye volny v plazme. ISBN 0-08-021680-3.

[2]Parker, TJ. and Haswell, WD. *A Text-book of zoology*. 5th ed., vol 1. revised by WD. Lang. London : Macmillan 1930. Section 12, Phyllum Mollusca, pp. 663-782.

[3]Wringley, EA. Parish registers and the historian. In Steel, DJ. *National index of parish registers*. London : Society of Genealogists, 1968, vol. 1, pp. 155-167.

[4]Communication equipment manufacturers. Manufacturing a Primary Industries Division, Statistics Canada. Preliminary Edition, 1970- . Ottawa : Statistics Canada, 1971- . Annual census of manufacturers. (in English), (in French). ISSN 0700-0758.

[5] Weaver, William. The Collectors: command performances. Photography by Robert Emmet Bright. Architectural Digest, December 1985, vol. 42, no. 12, pp. 126-133.

Footnote

[1] Leave this cell blank.

[2] The scope defines the limits of the use case.

[3] Stakeholder involved in the scenario - examples are: type of organization; customers, 3rd parties; end users; humans; environment; negative stakeholders (attackers, criminals, etc).

[4] Assets and values that are valuable to the stakeholders and at the risk of being compromised by the AI system deployment – examples can include competitiveness; reputation or trust; fairness; safety; privacy; stability; etc.

[5] Threats and vulnerabilities can compromise the assets and values above. Examples are: different sources of bias; incorrect AI system use; new security threats; challenges to accountability; new privacy threats (hidden patterns).

[6] AI method(s)/framework(s) used.

[7] Hardware system used.

[8] Topology is the study of geometric forms differentiated by intersection and bifurcation. The term is used for the graphic aspects network architectures.

[9] Terms and concepts listed here can be used to extend the work of WG 1 (AWI 22989 and AWI 23053) as necessary.

[10] The Sustainable Development Goals (SDGs), otherwise known as the Global Goals, are a collection of 17 global goals set by the United Nations General Assembly. SDGs are a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity.
See URL for more details: http://www.undp.org/content/undp/en/home/sustainable-development-goals.html

[11] Origin of data, which could be from instruments, IoT, web, surveys, commercial activity, or from simulations.

[12] Structured/unstructured Images, voices, text, gene sequences, and numerical. Composite: time-series, graph-structured

[13] The rate of flow at which the data is created, stored, analysed, or visualized.

[14] Data from a number of domains and a number of data types. The wider range of data formats, logical models, timescales, and semantics complicates the integration of the variety of data.

[15] Changes in data rate, format/structure, semantics, and/or quality.

[16] Completeness and accuracy of the data with respect to semantic content as well as syntactical of the data (such as presence of missing fields or incorrect values)

[17] Describe which condition(s) should have been met before this scenario happens.

[18] Describe which condition(s) should prevail after this scenario happens. The post-condition may also define "success" or "failure" conditions.

[19] The event that triggers the step. This might be completion of the previous event.

[20] Action verbs should be used when naming activity.

[21] Training data can be further specified.

[22] The event that triggers the step. This might be completion of the previous event.

[23] Action verbs should be used when naming activity.

[24] Specify input of evaluation.

[25] Specify output of evaluation.

[26] The event that triggers the step. This might be completion of the previous event.

[27] Action verbs should be used when naming activity.

[28] Specify input of evaluation.

[29] Specify output of evaluation.

[30] The event that triggers the step. This might be completion of the previous event.

[31] Action verbs should be used when naming activity.

[32] Retraining data can be further specified.