

# Master of Technology

## Computational Intelligence II

### Workshop: Financial planning system

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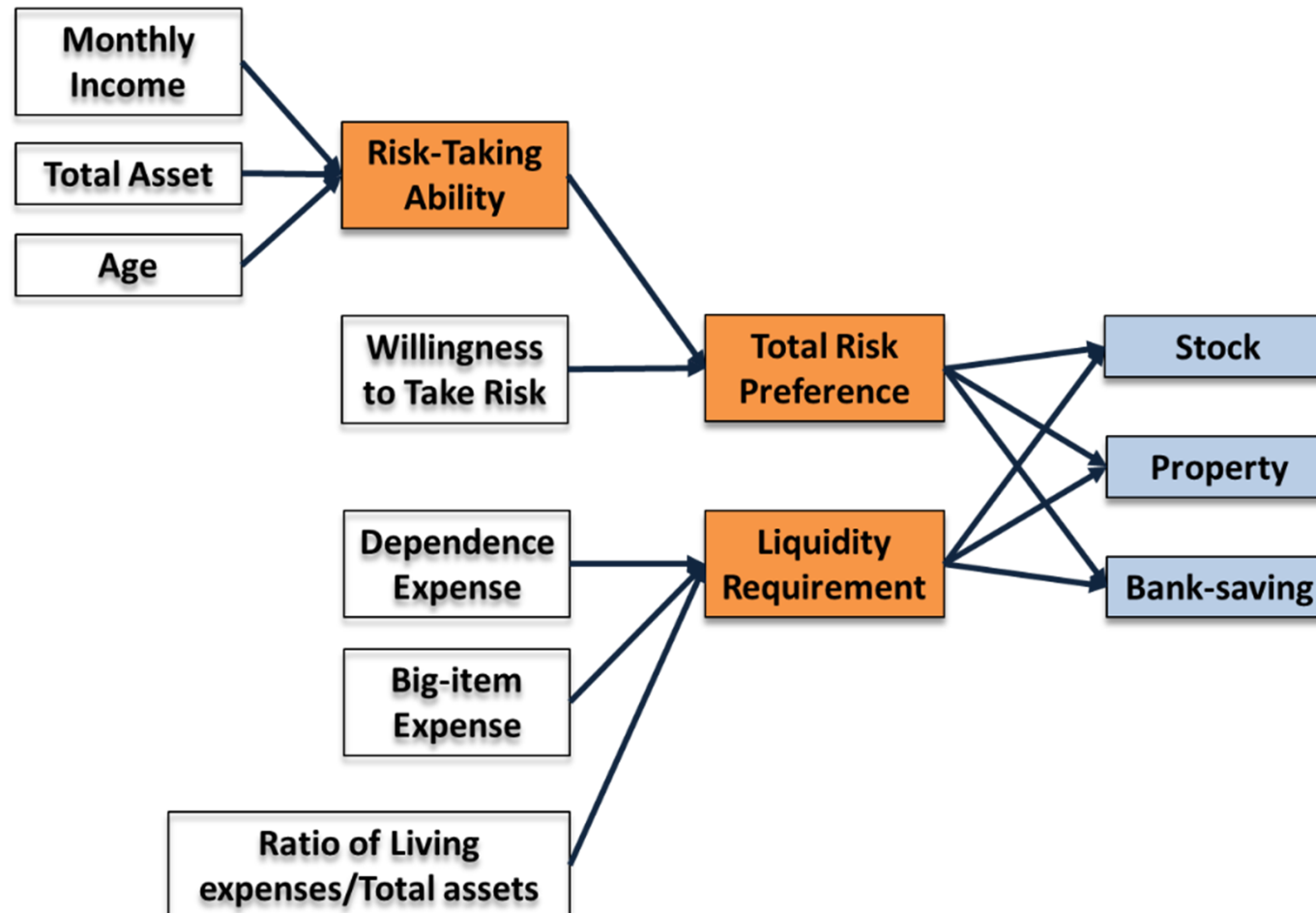
# Financial planning system

- Background information
  - » Design a fuzzy expert system “Financial Planner”, which will help user to make an investment plan in next five years including *Property*, *Bank-saving*, *Stock*, based on his/her *Age*, *Income*, *Current-Invest-Status*.
- Some relevant concerns (for reference only):
  - » If he/she already has property which takes a big portion of his/her current investment, then he/she should not buy another property in next 5 years
  - » If he/she has already put more than half of investment in stocks, then he/she should be careful in buying stocks
  - » If he/she is young and his/her income is relatively high, then he/she can invest more in stocks.
  - » Make assumptions on the range of investment (e.g. 10K ~ 1000K), the range of age, and the range of annual income, etc.

# Financial planning system

- Preparation
  - » problem understanding
- Design and build a fuzzy system
  - 1) select input and output variables
  - 2) input space fuzzy partitioning
  - 3) specify membership function for each linguistic term (input and output)
  - 4) design your system architecture
  - 5) determine fuzzy rule base(s) based on the domain knowledge
  - 6) determine other necessary settings, if any
- Test performance of the system

# Example



# Fuzzy input/output

No	Fuzzy Inputs/Outputs	Low	Medium	High
1	Monthly income	< \$3,000	\$2,000~\$8,000	\$7,000~\$20,000
2	Total assets	< \$500,000	\$300,000~\$1,000,000	\$800,000~\$2,000,000
3	Age	20~40	30~60	50~100
4	Willingness to take risk	< 0.4	0.3~0.7	0.6~1.0
5	Dependents' expenses	< 3 yrs from now	2~6 yrs from now	> 5~10 yrs from now
6	Big-item expenses	< 3 yrs from now	2~6 yrs from now	> 5~10 yrs from now
7	Ratio of Living expenses/Total assets	< 5%	3%~12%	10%~20%
8	Risk-taking ability	< 0.4	0.3~0.7	0.6~1.0
9	Total risk preference	< 0.4	0.3~0.7	0.6~1.0
10	Liquidity requirement	< 0.4	0.3~0.7	0.6~1.0
11	Stocks	< 0.4	0.3~0.7	0.6~1.0
12	Properties	< 0.4	0.3~0.7	0.6~1.0
13	Bank-savings	< 0.4	0.3~0.7	0.6~1.0

# Fuzzy rule (incomplete list)

(Monthly Income)		Risk-taking Ability		
High	Medium	High	High	
Medium	Low	Medium	High	
Low	Low	Low	Medium	
Age = Low		Low	Medium	High (Total Asset)

(Monthly Income)		Risk-taking Ability		
High	Low	Medium	High	
Medium	Low	Low	Medium	
Low	Low	Low	Low	
Age = Medium		Low	Medium	High (Total Asset)

(Monthly Income)		Risk-taking Ability		
High	Low	Low	Medium	
Medium	Low	Low	Low	
Low	Low	Low	Low	
Age = High		Low	Medium	High (Total Asset)

(Big-itme Expense)		Liquidity Requirement		
High	Medium	Low	Low	
Medium	Medium	Medium	Low	
Low	High	Medium	Medium	
Living expenses/Total assets = Low		Low	Medium	High (Dependence Expense)

(Big-itme Expense)		Liquidity Requirement		
High	Medium	Medium	Low	
Medium	High	Medium	Medium	
Low	High	High	Medium	
Living expenses/Total assets = Medium		Low	Medium	High (Dependence Expense)

(Big-itme Expense)		Liquidity Requirement		
High	High	Medium	Medium	
Medium	High	High	Medium	
Low	High	High	High	
Living expenses/Total assets = High		Low	Medium	High (Dependence Expense)

# System test

	customer profile
Case 4	Poor elderly lady supporting many dependents
Case 5	Middle-class middle-age family man
Case 6	Rretired rich businessman

	Monthly income	Total assets	Age	Willingness to take risk	Dependence expense	Ratio of Living expenses/Total assets	Big-item expenses
Case 4	2500	400000	65	0.35	1	20	1
Case 5	7500	900000	35	0.65	7	11	6.5
Case 6	1000	1000000	80	0.5	9	10	9

	Stocks	Property	Savings
Case 4	14.98%	14.98%	70.04%
Case 5	29.41%	41.18%	29.41%
Case 6	11.75%	33.33%	54.92%

**Thank you!**

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