

18th International Conference of the
Research Institute of Ophthalmology

RIO 2026

22 -23 JANUARY 2026
ROYAL MAXIM PALACE KEMPINSKI, CAIRO

AI and MIGS

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Disclosures



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AI in MIGS

- AI in glaucoma
- Why the need for AI in MIGS
- Current state of play
- The future

Why the need for AI in MIGS: So many different options

- TM bypass: device or deviceless
- TM deroofing
- SC dilation
- Supra-choroidal
- Ciliary process ablation
- MIBS

Which surgery for which patient?

- So many innovations in field of glaucoma
- So many surgical innovations
- So much financial investment
- WE ARE STILL IN AN ERA OF **NON-PERSONALISED** MIGS



How do we get personal



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How do we get personal

- We have to know **our** outcomes for **each** surgery
- We have to know wider surgeon outcomes for **each** surgery
- We have to know what target **each** patient requires

AI driven decision support for MIGS

- Umair Qidwai
- Uvais Qidwai
- Guy Mole
- Keith Barton
- Nathan Kerr



Contents lists available at ScienceDirect

MethodsX

journal homepage: www.elsevier.com/locate/mex



iMIGS: An innovative AI based prediction system for selecting the best patient-specific glaucoma treatment



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International Glaucoma Surgery Registry

80 surgeons have entered 1 or more operation each

11 surgeons have entered 100 or more operations each

6 surgeons have entered 500 or more operations each

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Currently: > 11,000 operations logged

The science bit



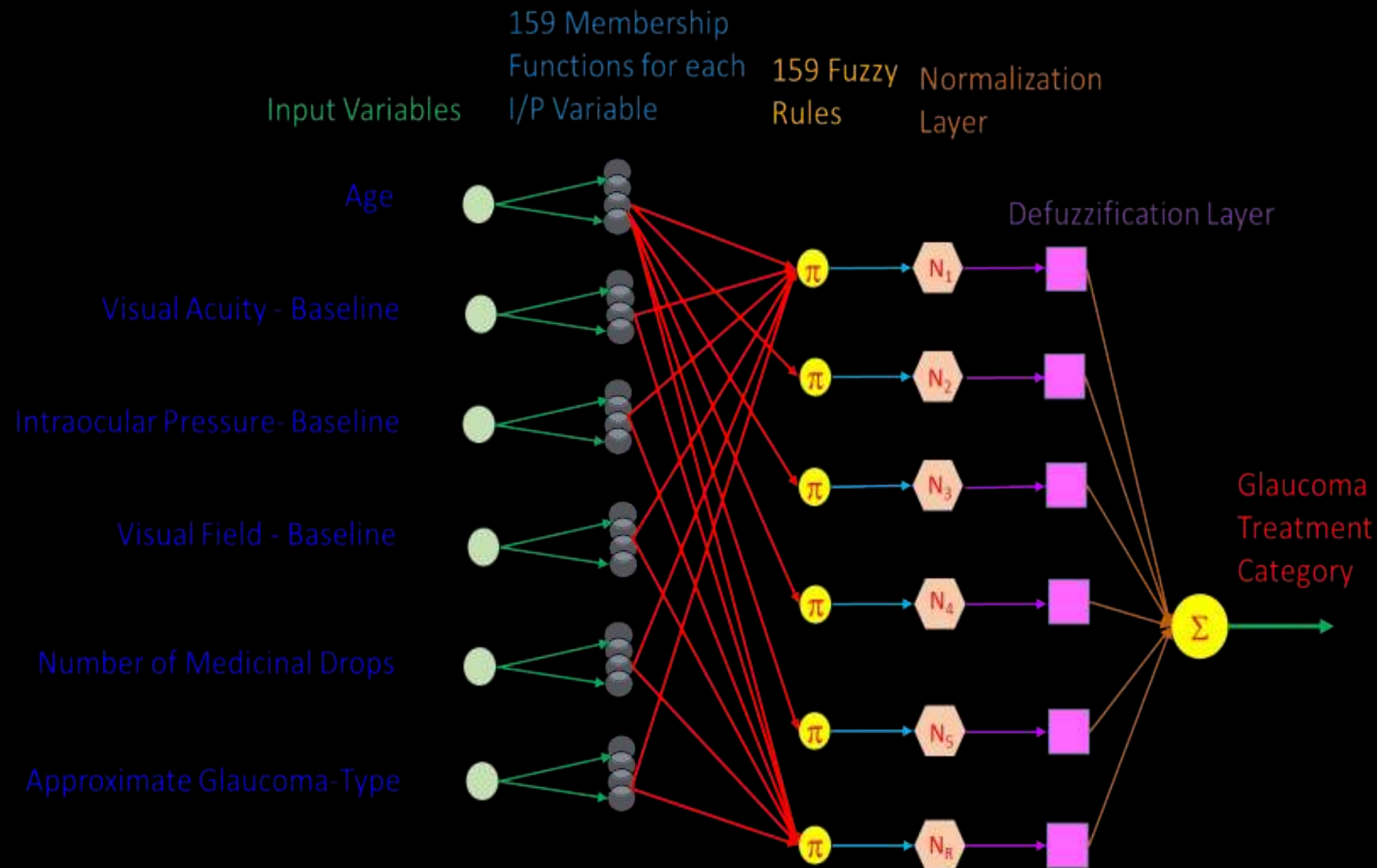
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Adaptive Neuro Fuzzy Inference System (ANFIS)

- Data is clustered based on its similarity scores into a number of clusters – looks for trends
- Fuzzy rules are essentially If-Then-Else type of rules

$$TC_i = [Age_i \quad VA_i \quad VF_i \quad IOP_i \quad Drops_i \quad Type_i] \begin{bmatrix} a_1 \\ a_2 \\ a_3 \\ a_4 \\ a_5 \\ a_6 \end{bmatrix} \quad 0 < i < N$$

- 60% of the available clinical data for training
- 40% for testing against the surgical outcomes



Diagnosis

- Primary open-angle glaucoma
- Normal tension glaucoma
- Secondary open-angle glaucoma
- Late onset childhood / juvenile open-angle glaucoma
- Primary angle-closure glaucoma
- Ocular hypertension
- Angle closure glaucoma
- Secondary angle-closure glaucoma

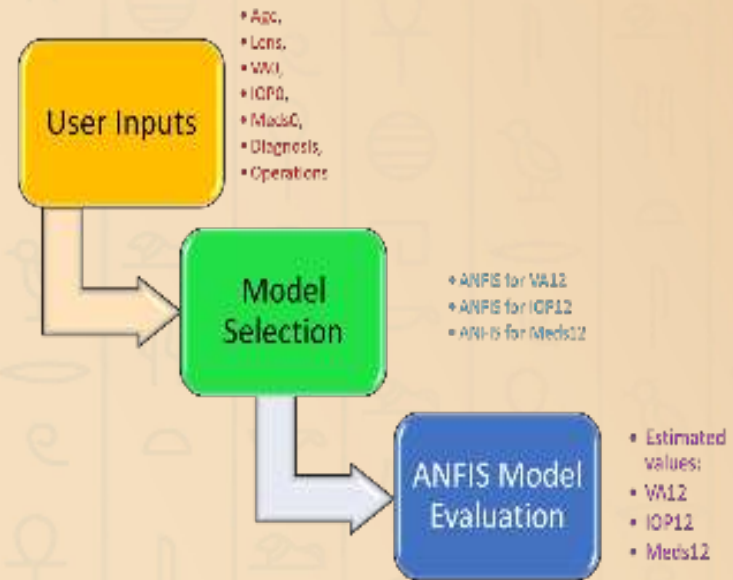
Treatment options

- iStent
- Hydrus
- iTrack
- OMNI
- ECP
- Istent + ECP
- Miniject
- Xen
- Preserflo
- Trabeculectomy
- Glaucoma drainage device
- CPC

VA12_IOP12_Meds12 Operations

Age	0	Predict	VA12	0
Lense	0		IOP12	0
VA0	0		Meds12	0
IOP0	0			
Meds0	0			
Operations	0			

Ophnosis^{MIGS}

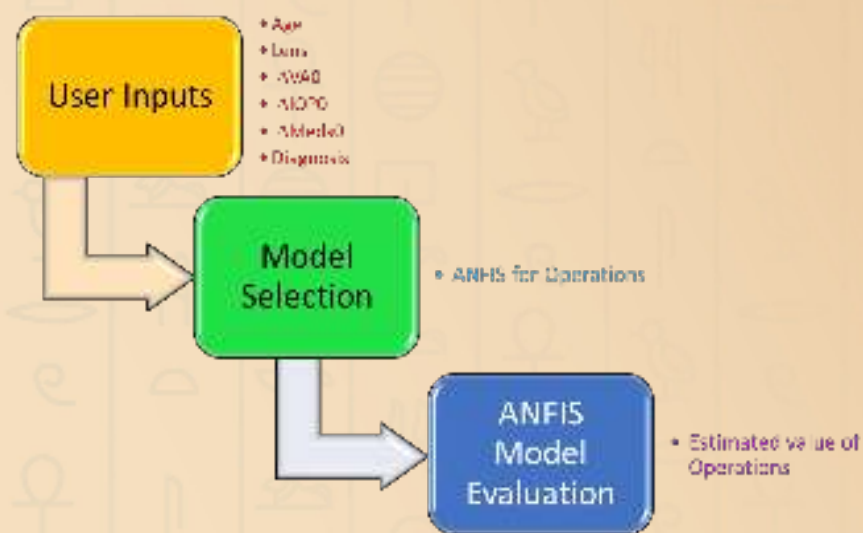
VA12, IOP12, Meds12 Operations

Age	0
Lense	0
delVA	0
delIOP	0
delMeds	0
Diagnosis	0

Button Operations



OphnosisMIGS



	VA12	IOP12	Meds12	Operations
Number of Input Membership Functions	22	22	1494	504
Number of Rules	2916	2916	1494	504
Final Model Error (MSE)	< 0.5%	< 0.5%	< 0.5%	< 0.5%
Final Model Correlation with the actual data	95.5%	87.6%	99.9%	97.6%
Significance of the predictions (P-value)	< 0.0001	< 0.0001	< 0.0001	< 0.0001

Next steps

- Test the model prospectively
- More surgeons
- Variety of surgeon experience
- Keep the model updated as new surgeries are developed
- First steps towards **PERSONALISED** MIGS

Acknowledgements

- Umair Qidwai
 - Uvais Qidwai
 - Guy Mole
 - Thurka Sivapalan
 - Keith Barton
 - Nathan Kerr
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Podcasts



Spotify



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