

# Iris Based Diagnosis System

**Tassadaq Hussain**

Associate Prof: Riphah Int'l University

Microsoft Research and Barcelona Supercomputing Center

Barcelona, Spain

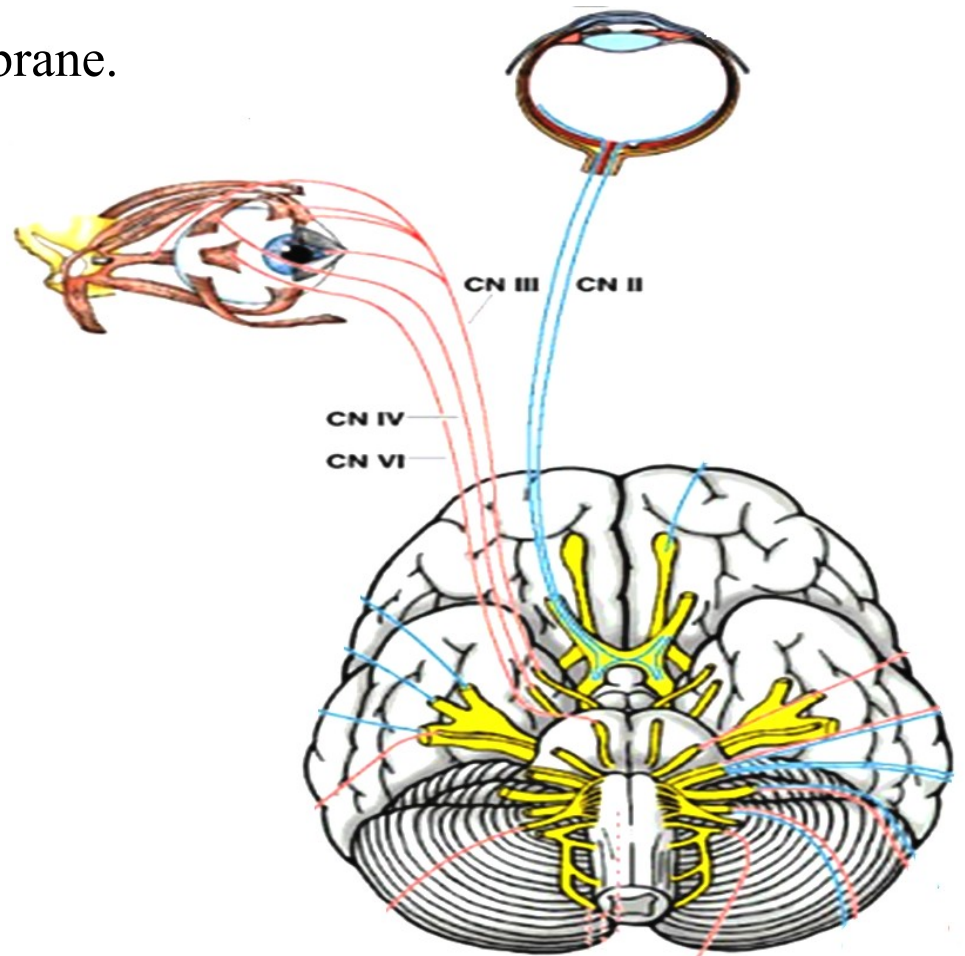
UCERD Pvt Ltd Islamabad

# Contents

- **Problem Statement.**
- Proposal.
- Iris Based Disease Diagnostic Environment.
- Preliminary Results.
- Conclusion.

# Iris Introduction

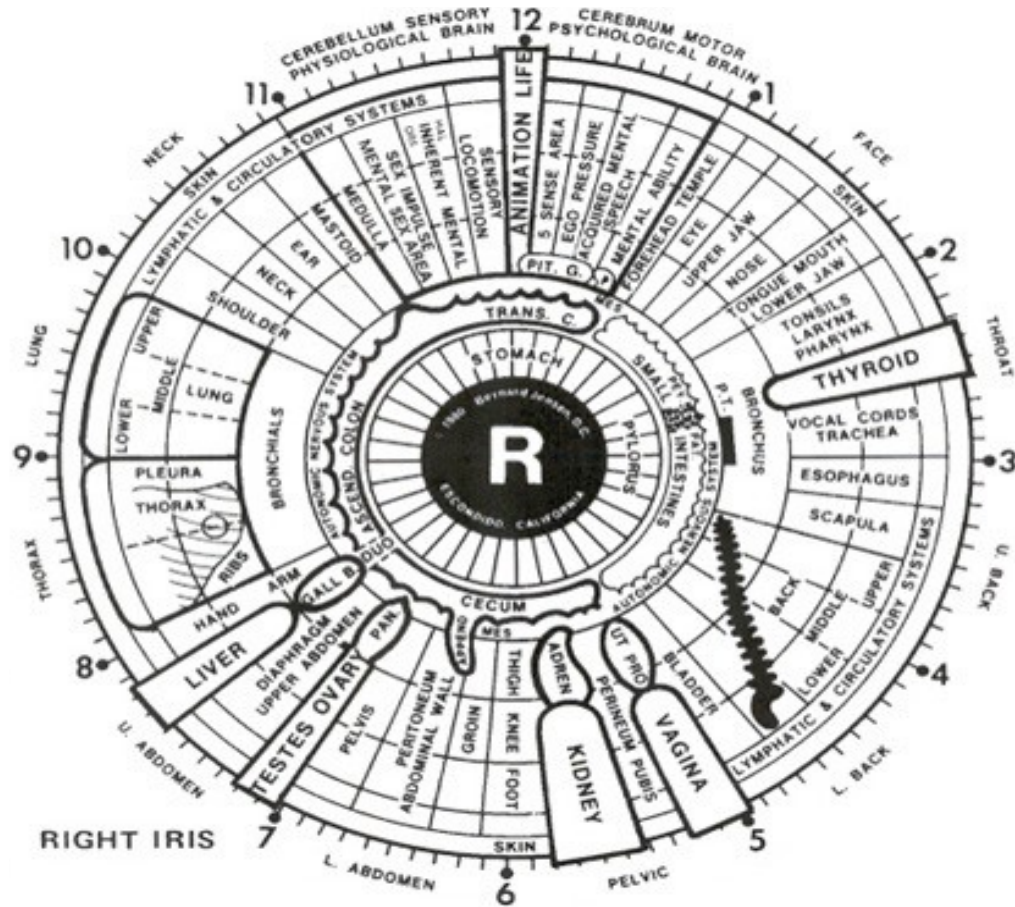
- Iris is circular and pigmented membrane.
- Connected to the Nervous System.
- Spinal Cord and Sympathetic Nervous system.



*Figure: Ocular path is controlled by four pairs of Cranial nerves [1].*

# Iridology

- Person health, hereditary predisposition and level of health.
- Research.
- Diabetes, Pulmonary conditions, Cholesterol detection, Orthopedic trauma, Kidney and Gall stones.



*Figure: Iridology Chart. Every region in the chart delineates the particular organ inside the body [2].*

# Conventional Disease Diagnosis

- Invasive and Non Invasive
- Costly
- Process
- Painful
- Accuracy
- Expert

# Solution

- A non-invasive methods of disease diagnostic environment
  - Input Iris
  - Use Iridology Map
  - Applies artificial intelligence techniques
  - Diagnose disease

# Challenges

- Disease time criticality varies.
- Data acquisition, analysis problems.
- Stable and established algorithms are not available.
- Programming Environment, Toolkits and Processing  
System architectures.

# Contents

- Problem Statement.
- **Proposal.**
- Iris Based Disease Diagnostic Environment.
- Preliminary Results.
- Conclusion.



# Iris based Disease Diagnostic Environment



A non invasive and intelligent diseases diagnostic environment that provides painless, time saving and user friendly methods for diagnosing multiple diseases compared to conventional methods.

# Salient Features

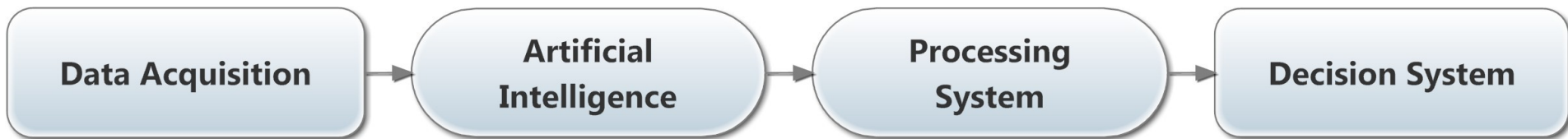
- Multiple Medical Problems
  - Iridology based using iris images
- Processing System
  - Real-time
    - Standalone, Instantaneous Results
  - Non Real-time
    - Training
- Artificial Intelligence
  - Supervised Learning
  - Unsupervised Learning
- Languages
  - Scripting and Programming

# Contents

- Problem Statement.
- Proposal.
- **Iris Based Diagnosis System.**
- Preliminary Results.
- Conclusion.

# Iris Based Disease Recognition System

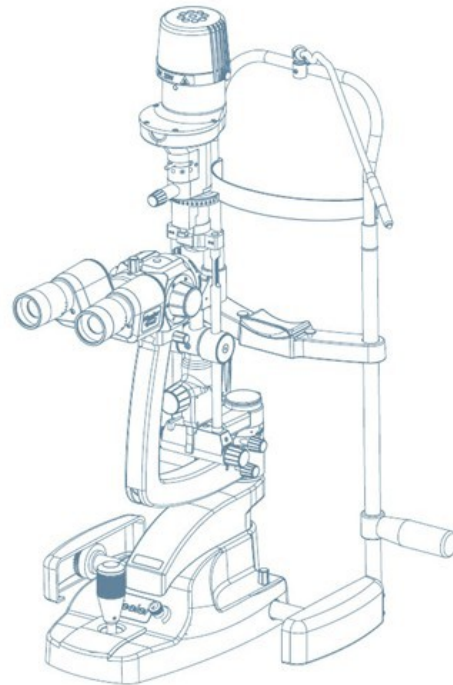
- 1) Data acquisition
- 2) Artificial Intelligence
- 3) Processing System



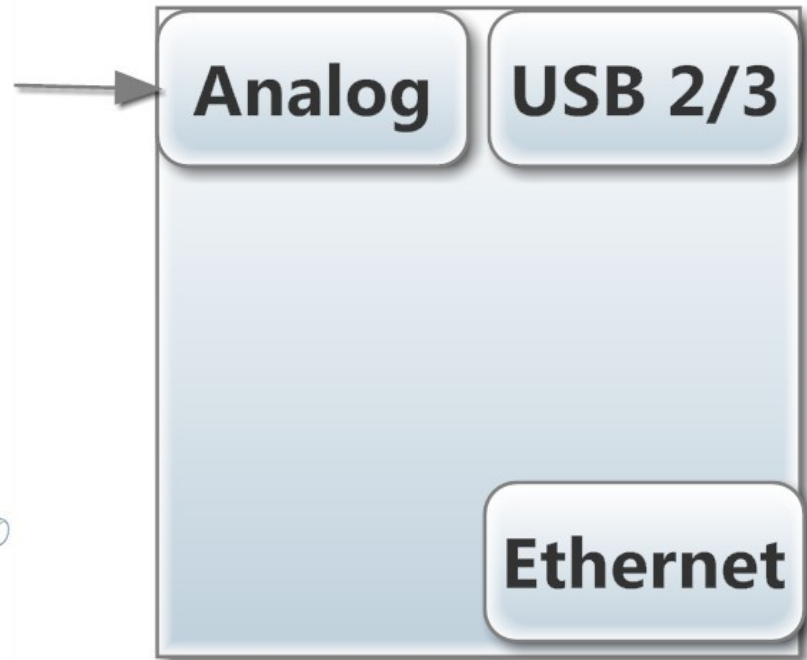
# Data Acquisition

- Front-end Interface
- Targeted Diseases
- Analysis and Features

# Front-end Interface



Slit-lamp



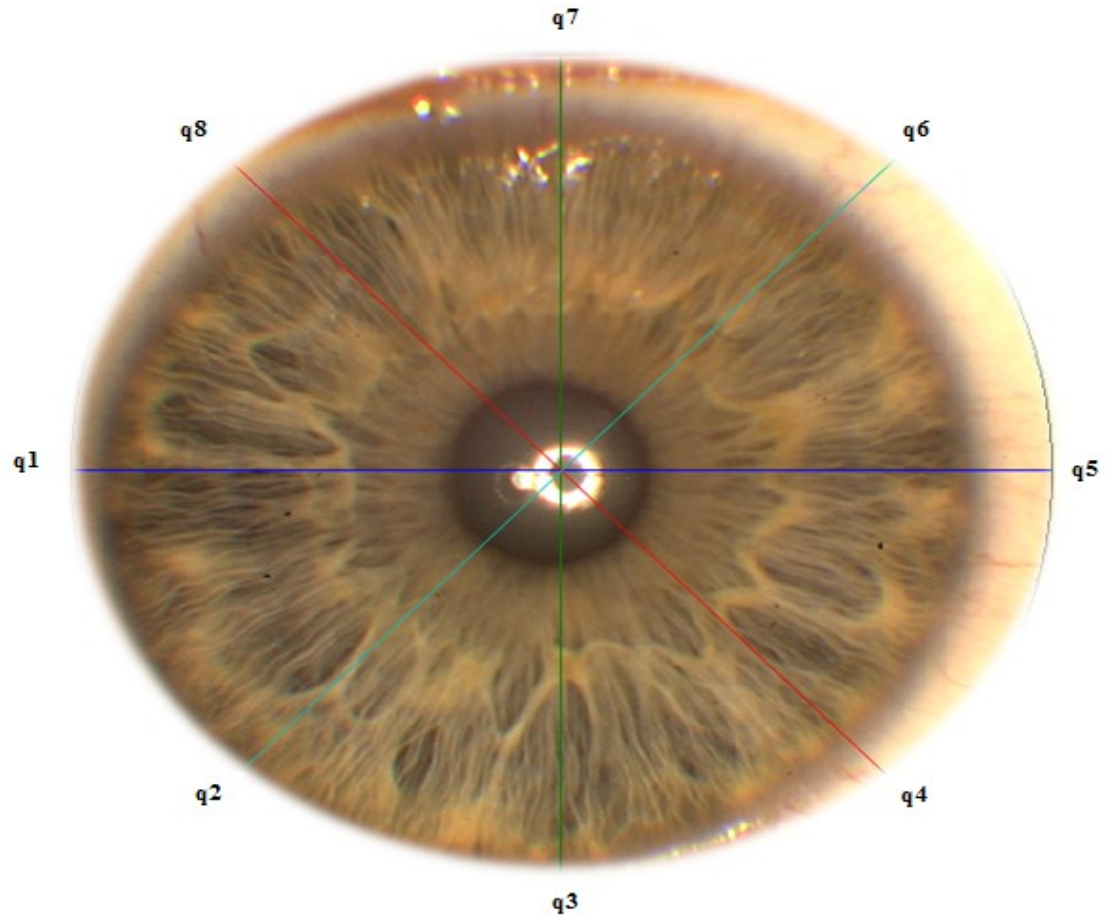
Front-end Interface

# Targeted Diseases

- Lungs
- Stress (Nervous System)
- Liver Disorder
- Stomach acidity
- Diabetes

# Analysis and Features

- Geometry
  - Coordinates
- Shape
  - Templates
- Size
- Color



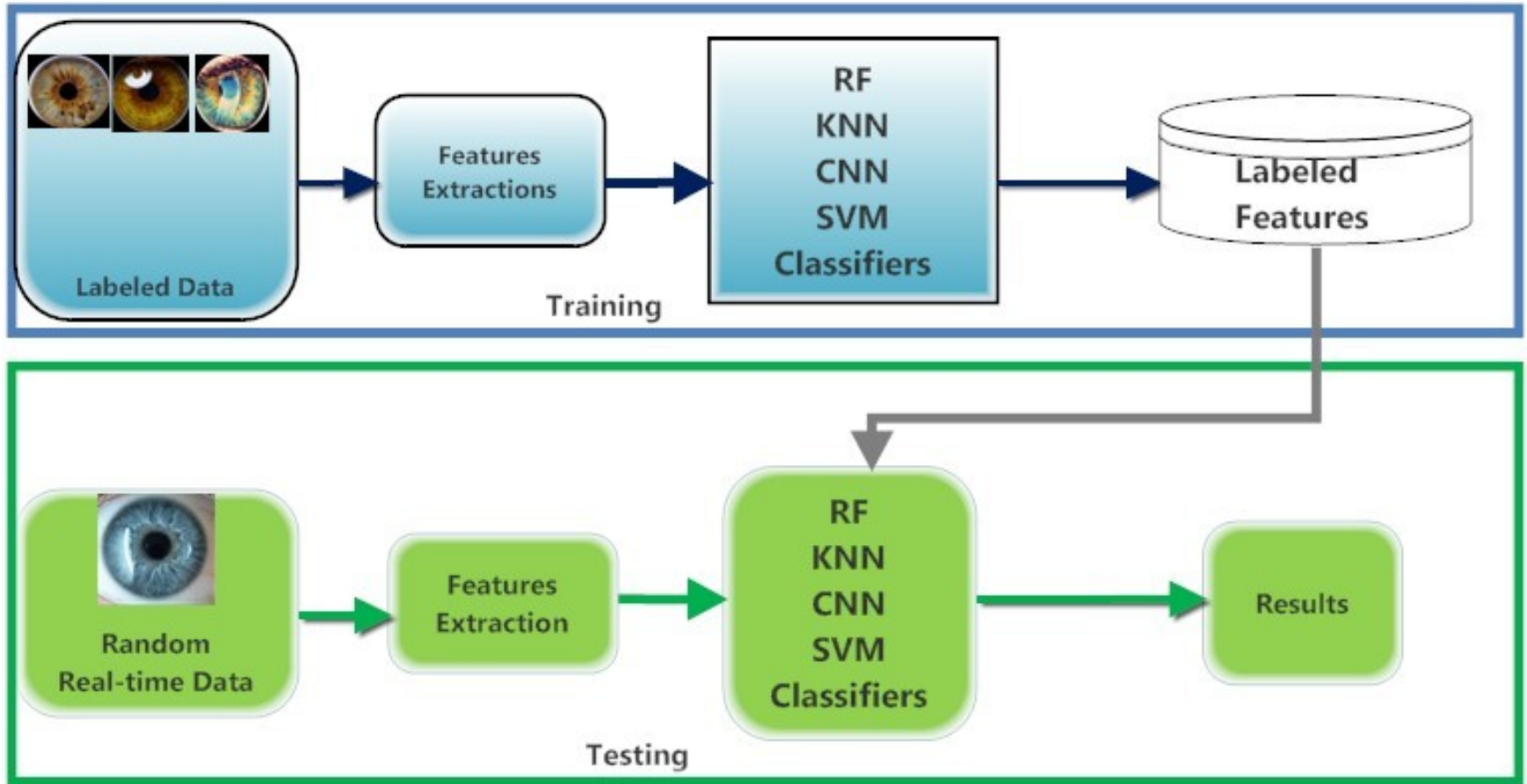
*Figure: Iris segmented after every 45 degrees.*



# Artificial Intelligence Framework

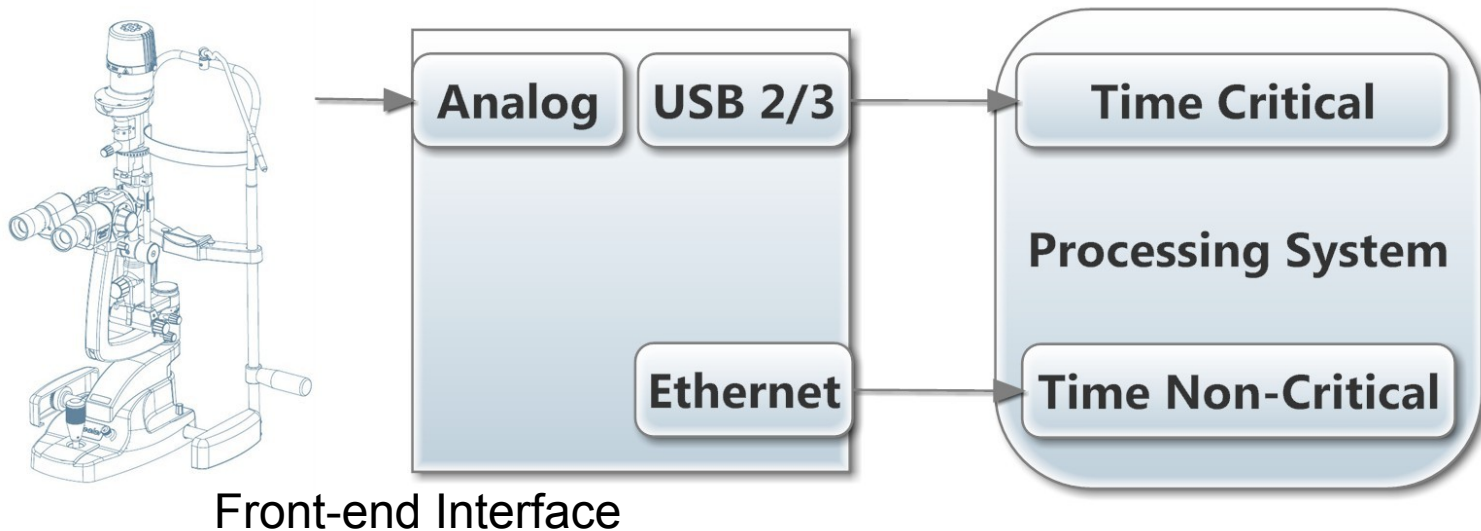
- Programming
  - Simulation
    - Python
    - Machine Learning
    - OpenCV
  - Execution
    - C/C++
    - Machine Learning
    - OpenCV

# AI Algorithm



# Processing System

- Real-time Systems
  - Jetson TK1, Parallella, FPGAs
- Non Real-time Systems
  - Supercomputers (CPU-GPU based)



# Contents

- Problem Statement.
- Proposal.
- Iris Based Disease Diagnostic Environment.
- **Preliminary Results.**
- Conclusion.

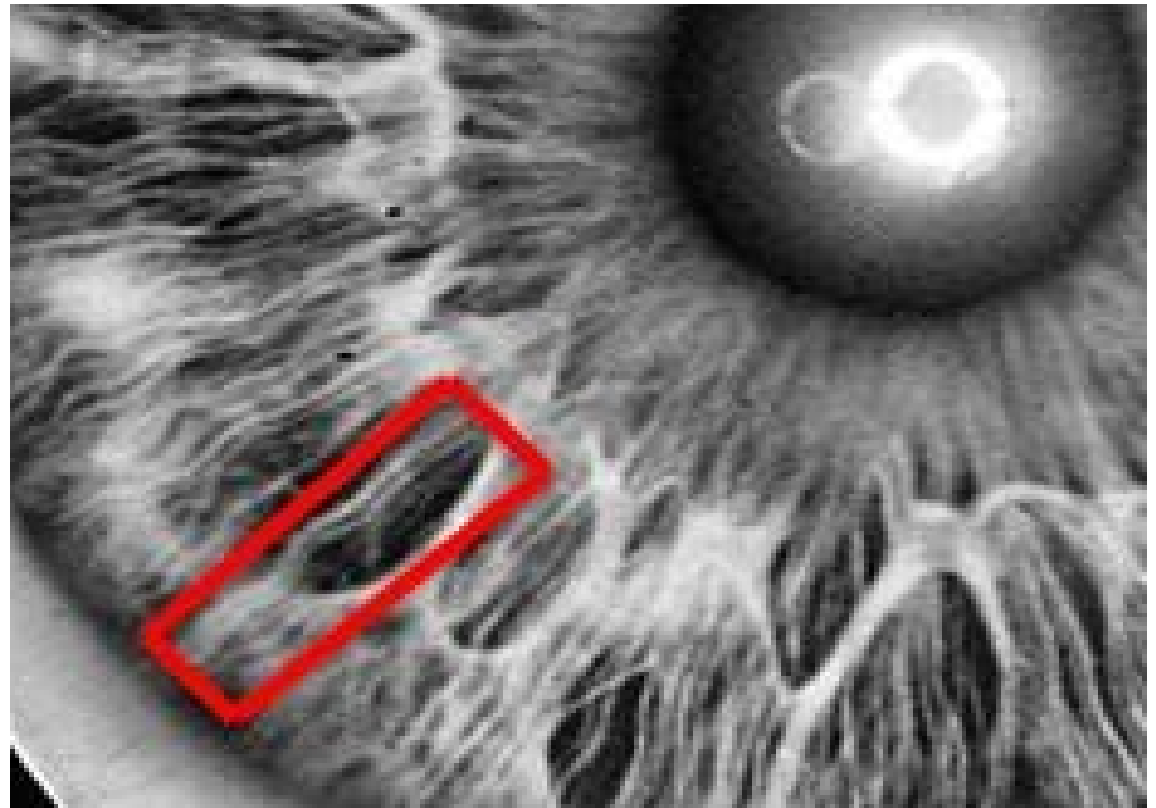
# Preliminary Results

- Templates of Targeted Diseases
- Template Matching
  - Liver disorder against normal, weak and strong patterns.
  - Diabetes against normal, weak and strong patterns.
  - Stomach acidity against normal, weak and strong patterns.
- Machine Learning

# Features: Liver Disorder

- 1<sup>st</sup> coordinate.
- Open Lesion

Liver  
zone.

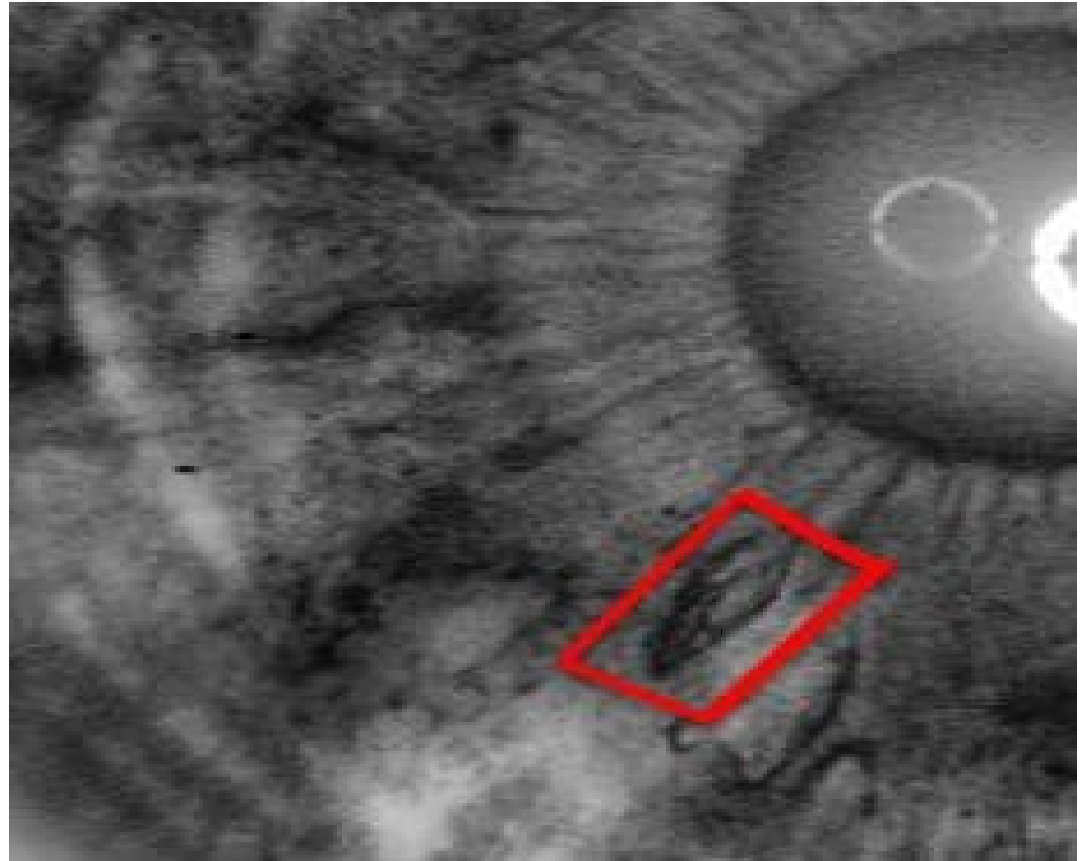


*Figure: Liver region demonstrating the changes due to Liver disorder.*

# Features: Diabetes

- 2<sup>nd</sup> coordinate.
- Diamond Shape

Pancreatic region  
in iris.

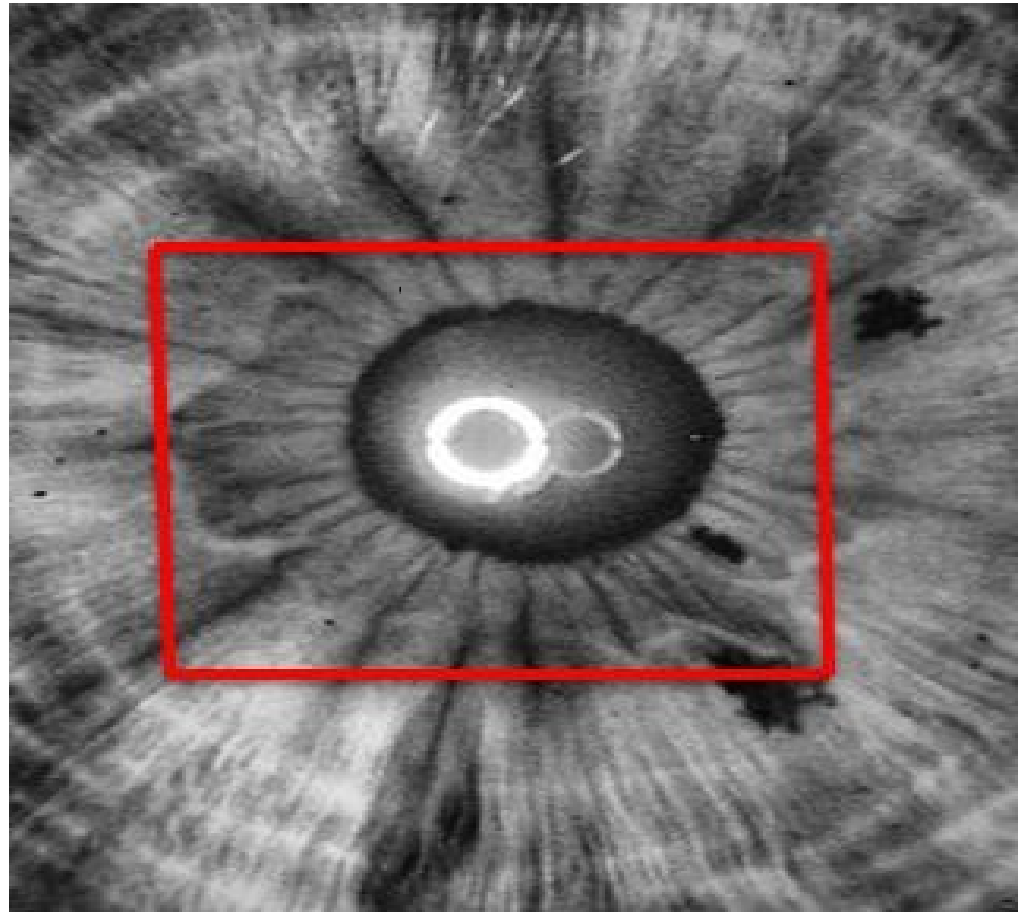


*Figure: Pancreatic pattern in iris that describes the variation in lesions and crypts for Diabetic patients.*

# Features: Stomach Acidity

- Halo around pupil.

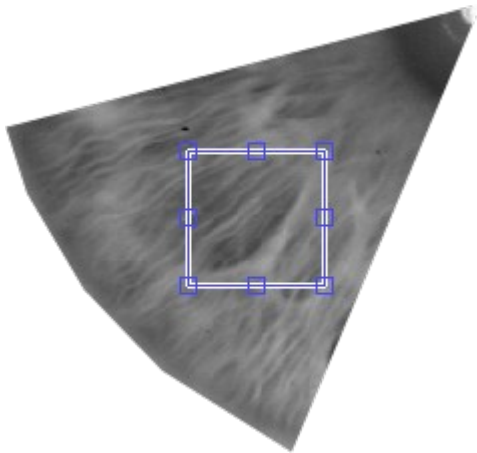
Stomach  
Halo.



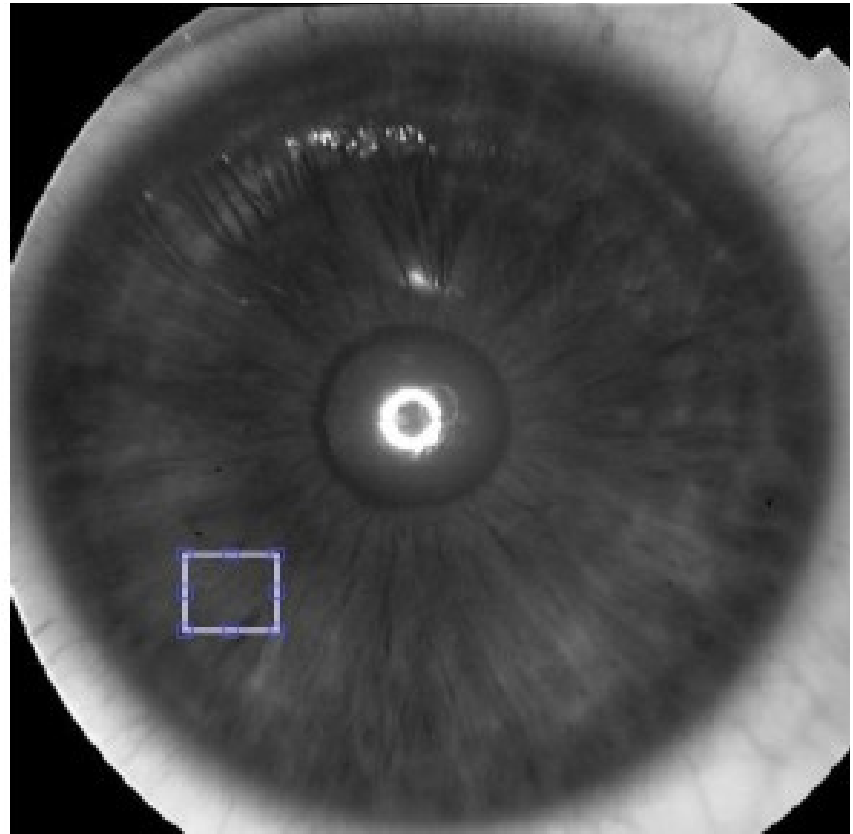
*Figure: Stomach halo appears in the iris because of stomach acidity.*



# Supervised Learning using Template Matching: Liver Disorder against Normal Eye

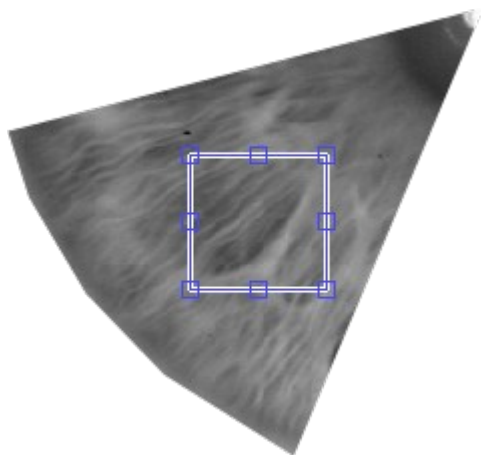


*Liver disorder template.*

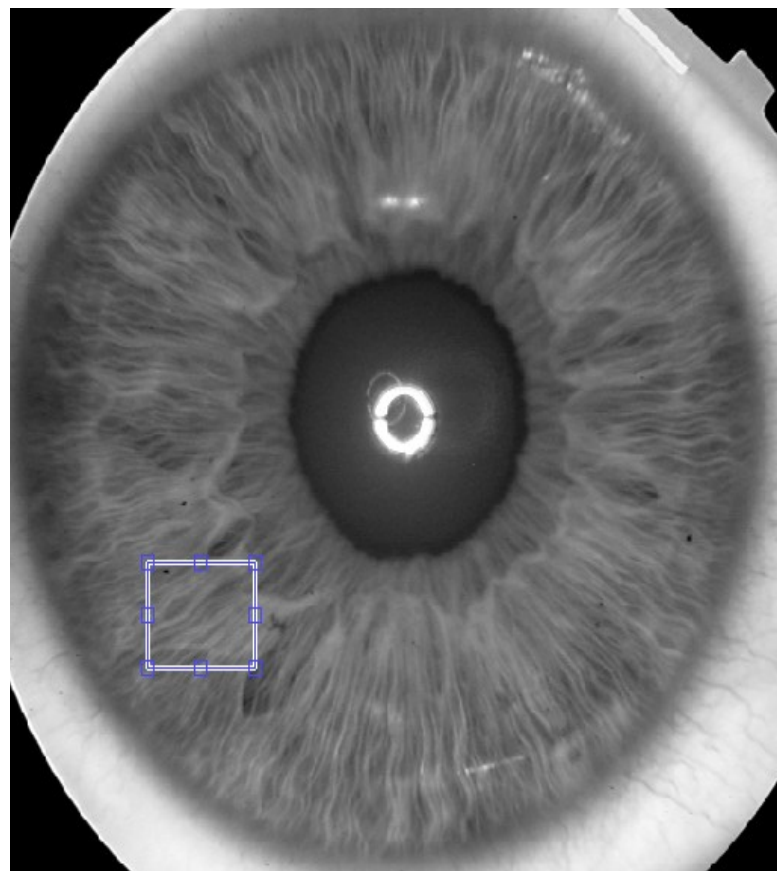


*Iris having no signs for Liver disorder.*

# Liver Disorder Against Weak Patterns

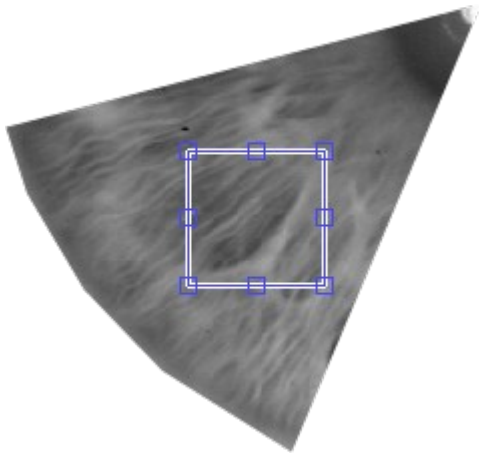


*Liver disorder template.*

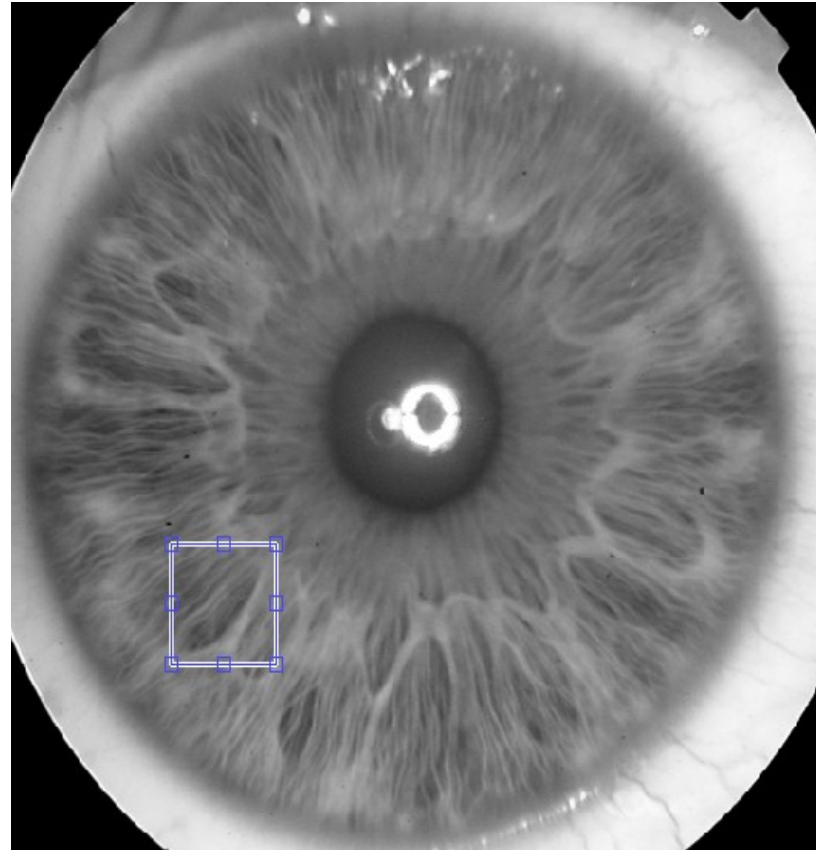


*Iris having weak signs for Liver disorder.*

# Liver Disorder against Strong Patterns

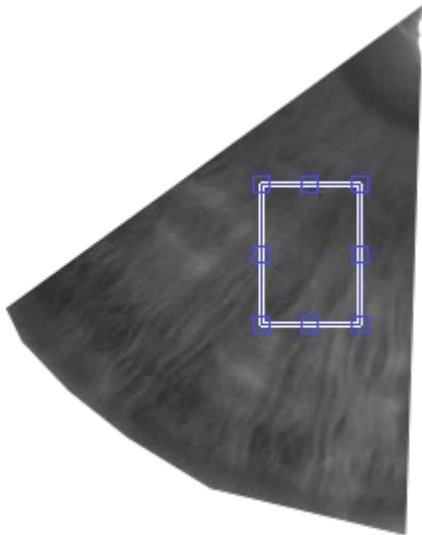


*Liver disorder template.*

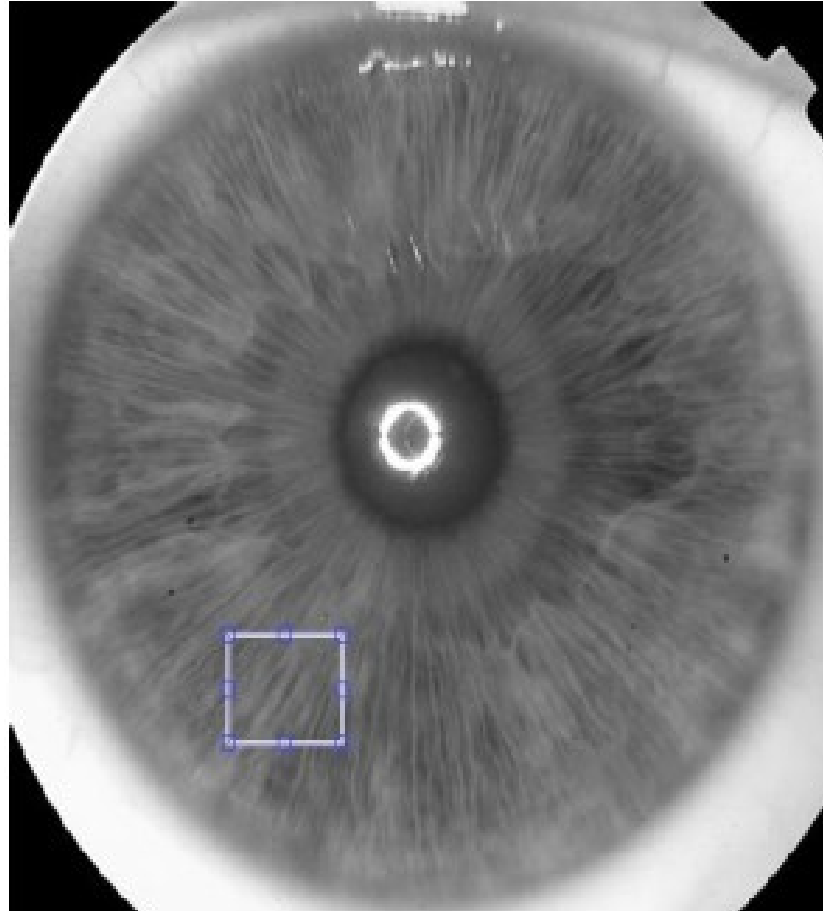


*Iris having strong patterns for Liver disorder.*

# Diabetes Against Normal Patterns

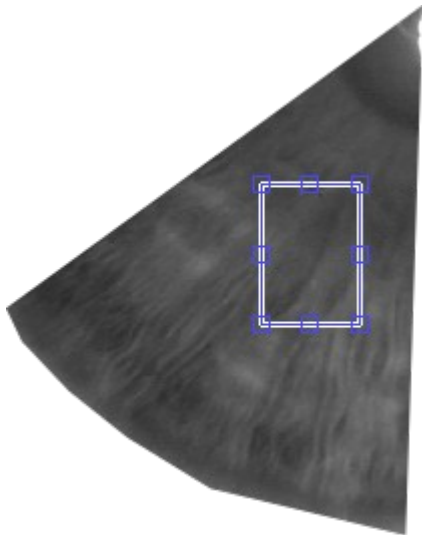


*Diabetes template.*

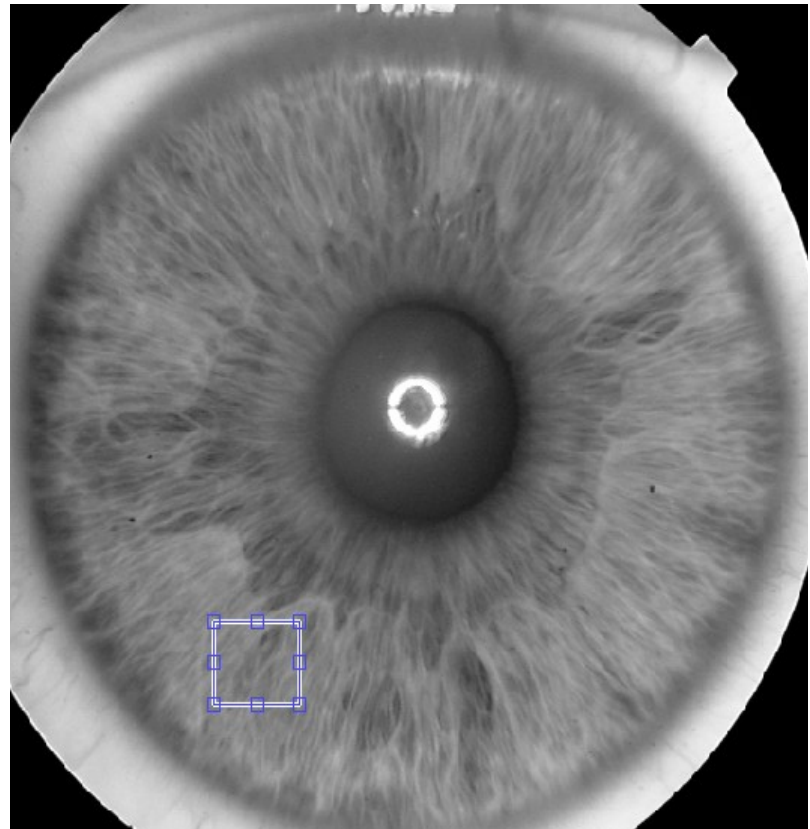


*Iris having no signs for Diabetes.*

# Diabetes Against Weak Patterns

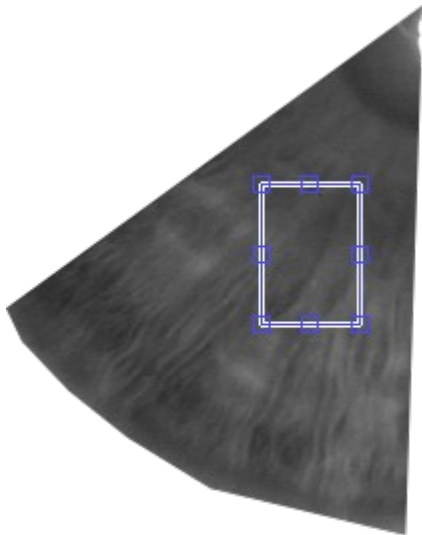


*Diabetes template.*

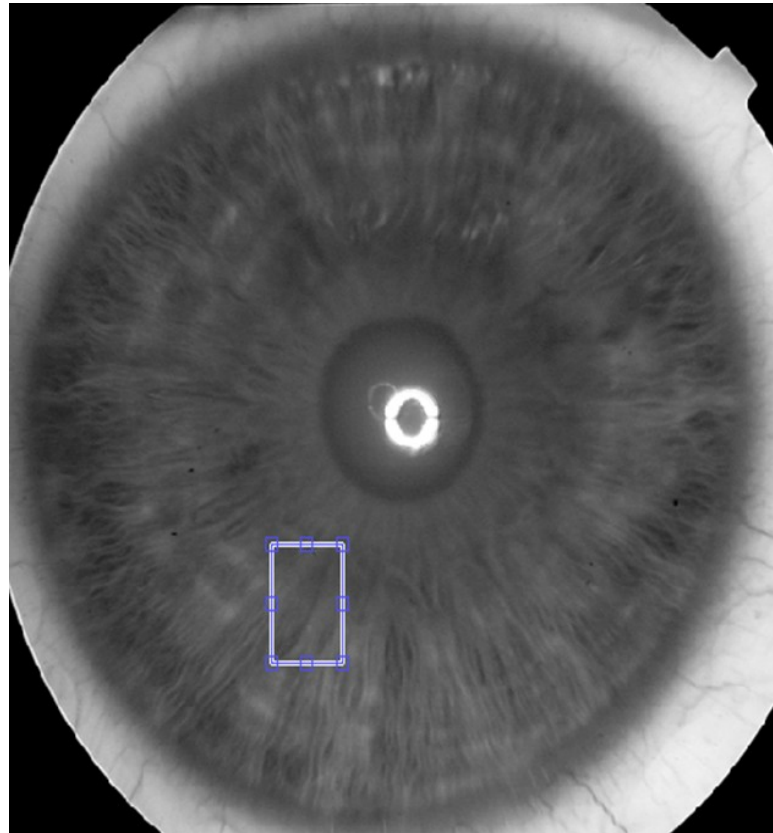


*. Iris having weak signs for Diabetes.*

# Diabetes: Strong Patterns

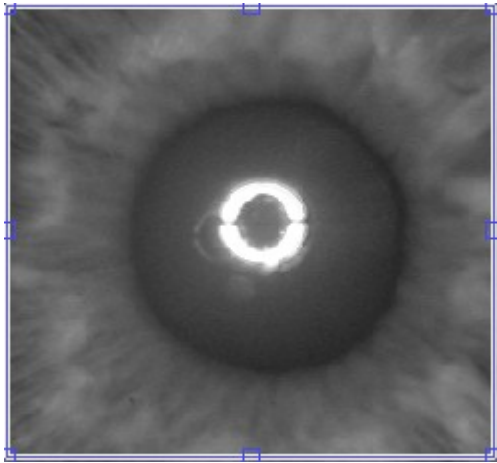


*Diabetes template.*

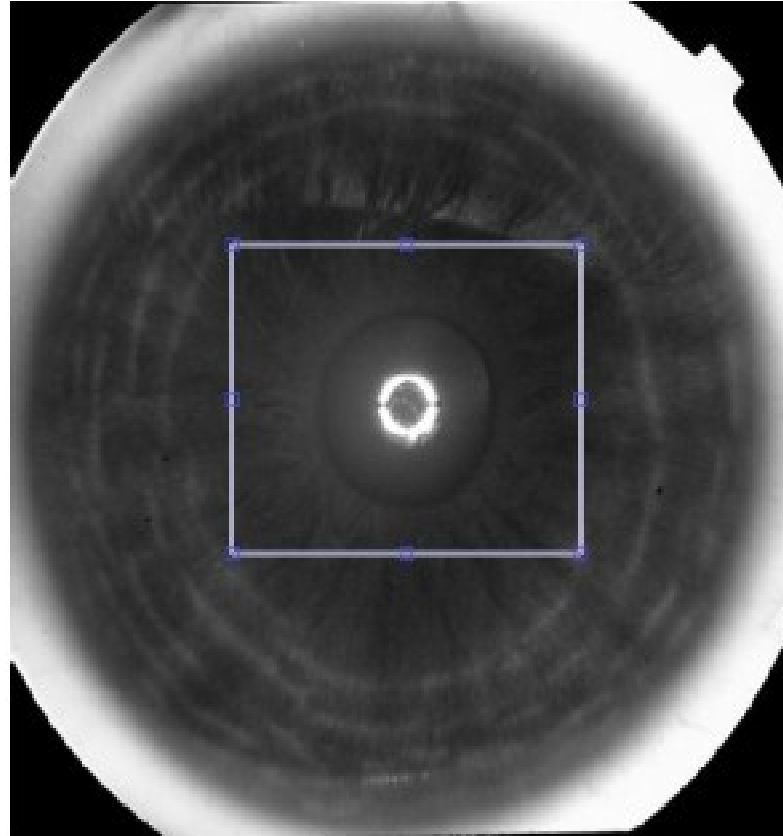


*. Iris having strong signs for Diabetes.*

# Stomach Acidity: Normal Patterns

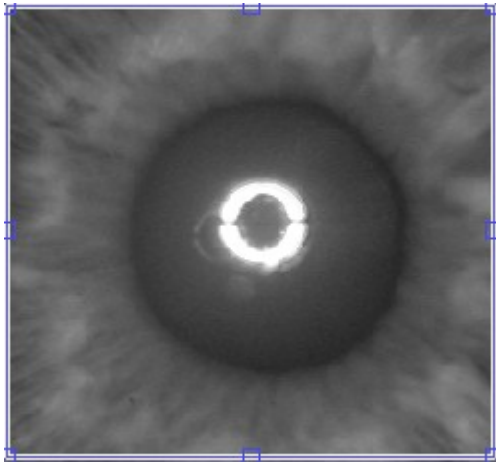


*Stomach acidity template*

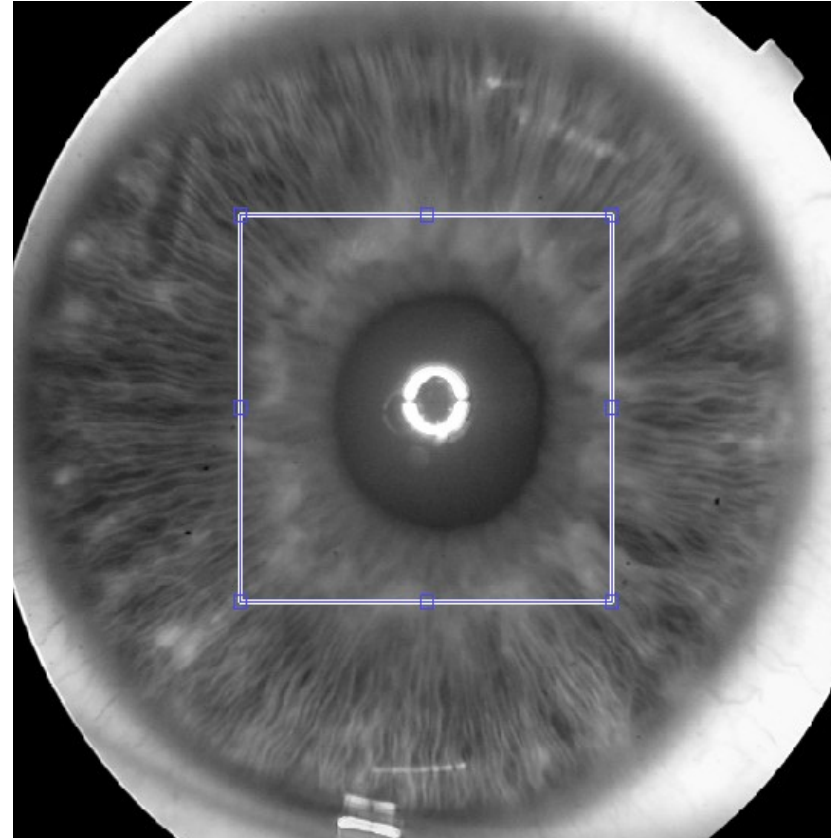


*. With no signs for Stomach acidity.*

# Stomach Acidity: Weak Patterns



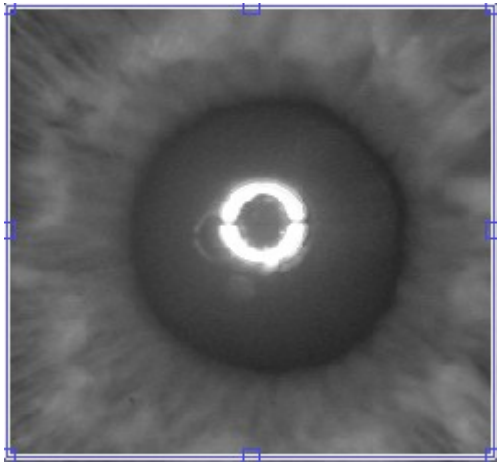
*Stomach acidity template*



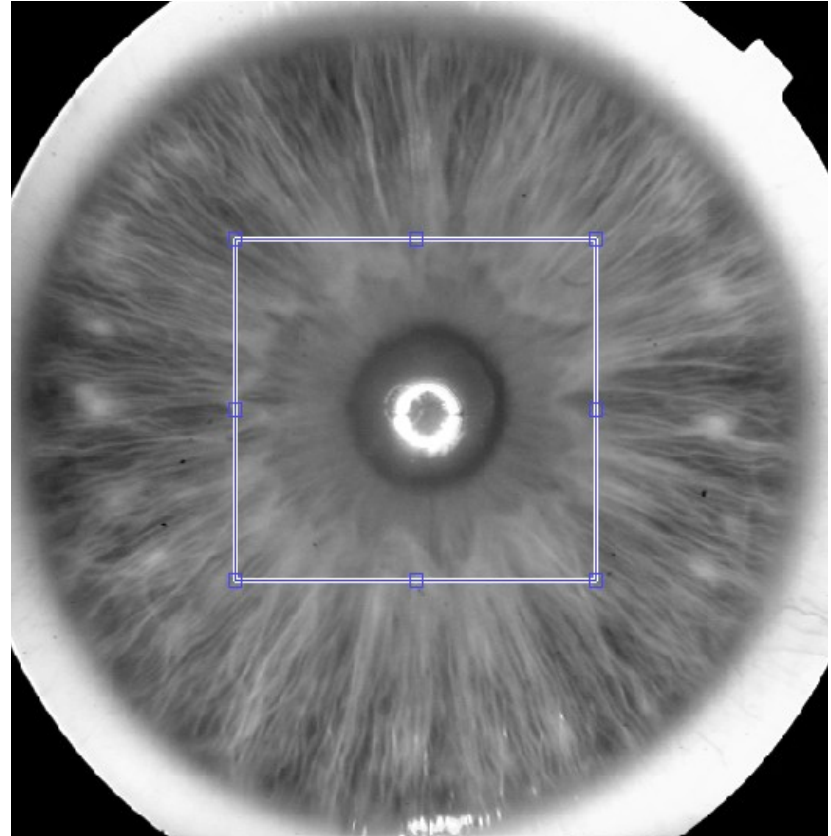
*. With weak signs for Stomach acidity.*



# Stomach Acidity: Strong Patterns



*Stomach acidity template*



*. With strong signs for Stomach acidity.*

# Machine Learning using SVM

- Database – 4 datasets

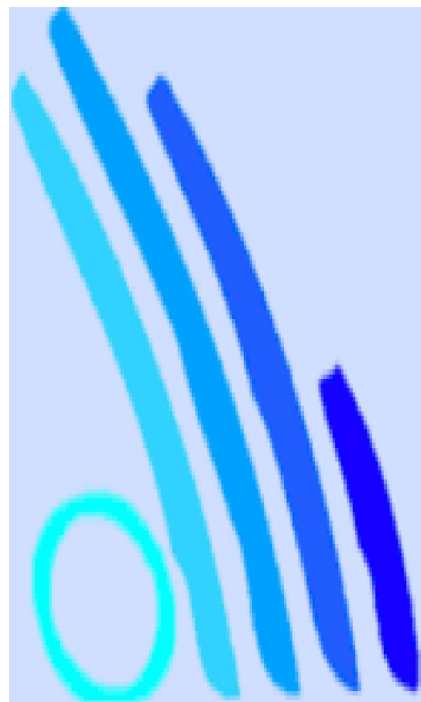
Sr.No.	Input images of iris	Database	Accuracy
1.	Diabetes	Diabetes/ Healthy iris.	100%.
2.	Liver Disorder	Liver disorder/ Healthy iris	58%
3.	Stomach acidity	Stomach acidity/ Healthy iris.	80%.

# Contents

- Problem Statement.
- Proposal.
- Iris Based Disease Diagnostic Environment.
- Preliminary Results.
- **Conclusion.**

# Conclusion

- An Iris based Disease Diagnostic Environment is proposed.
- The environment uses **iris images** and based on **iridology map**, it **diagnose a diseases** using **artificial intelligence techniques** on **high performance processing systems**.
- The proposed processing systems are proposed to run in real-time and non-real time environments



**UCERD**

**Consultancy for:  
FYPs and Future Career Guidance.  
Engineering Workshops, Master  
and Ph.D. thesis.**

**Design and Develop Industrial  
Digital Systems.**

**[www.ucerd.com](http://www.ucerd.com)**

**Thanks**



# Nerve Stress

- Depressions in stroma.
- Referred as neurovascular cramp rings or contraction rings.
- Represents degree of nerve tension or Anxiety.
- Indicate neuro muscular tension and stress.

Nerve Rings/  
Stress Rings

