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AEye™

Big Data Challenges and Opportunities

Anthony Vipin Das, FRCS

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Financial Disclosures

None

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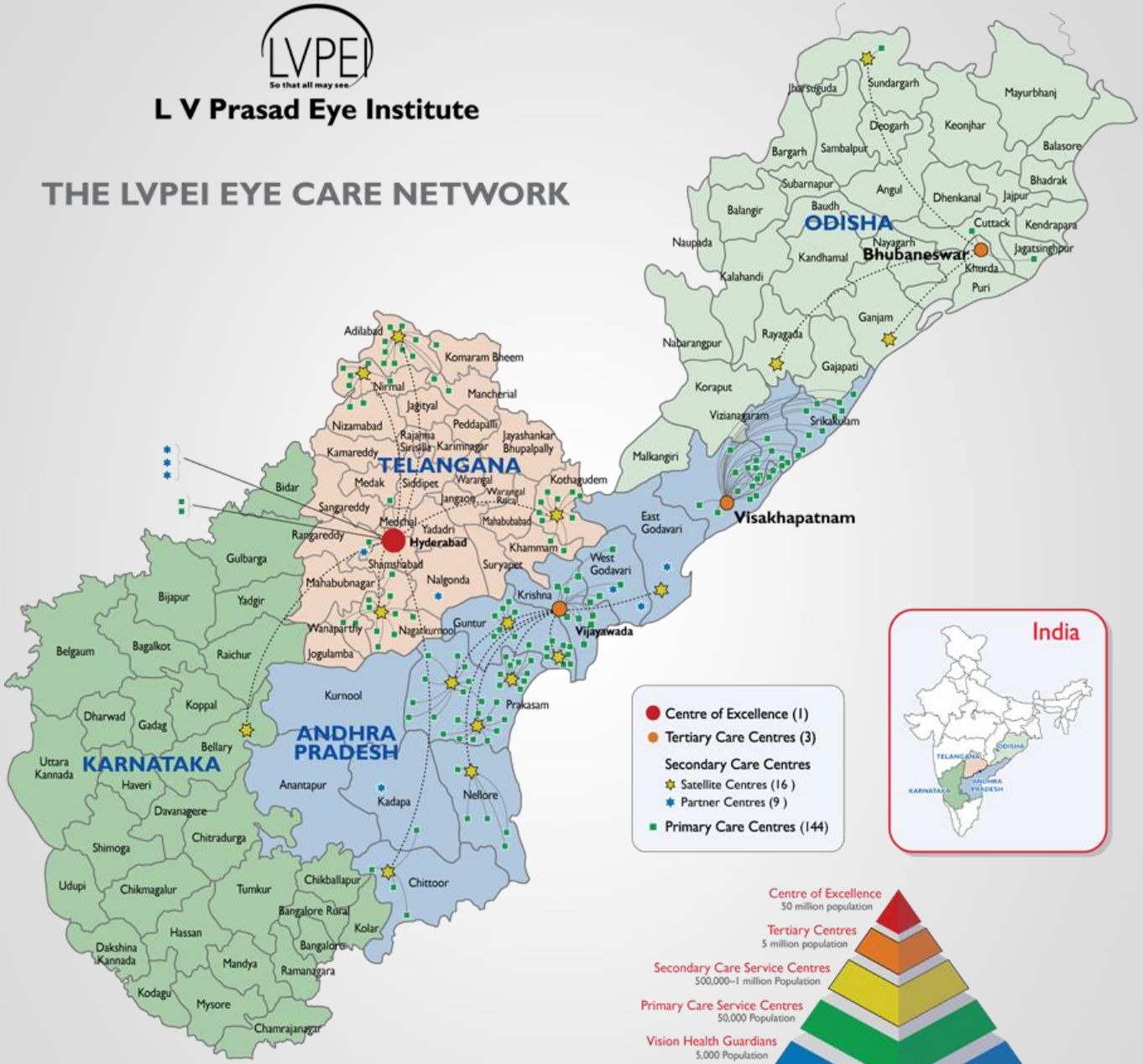
THE LVPEI EYE CARE NETWORK



As of January 2017 we have 144 Vision Centres, 16 Service Centres,
3 Tertiary Centres and our flagship Centre of Excellence.

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Building a DIGITAL Institution

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CoE

Tertiary

Secondary

Vision Centre Complex

202 Centres - 8 yrs

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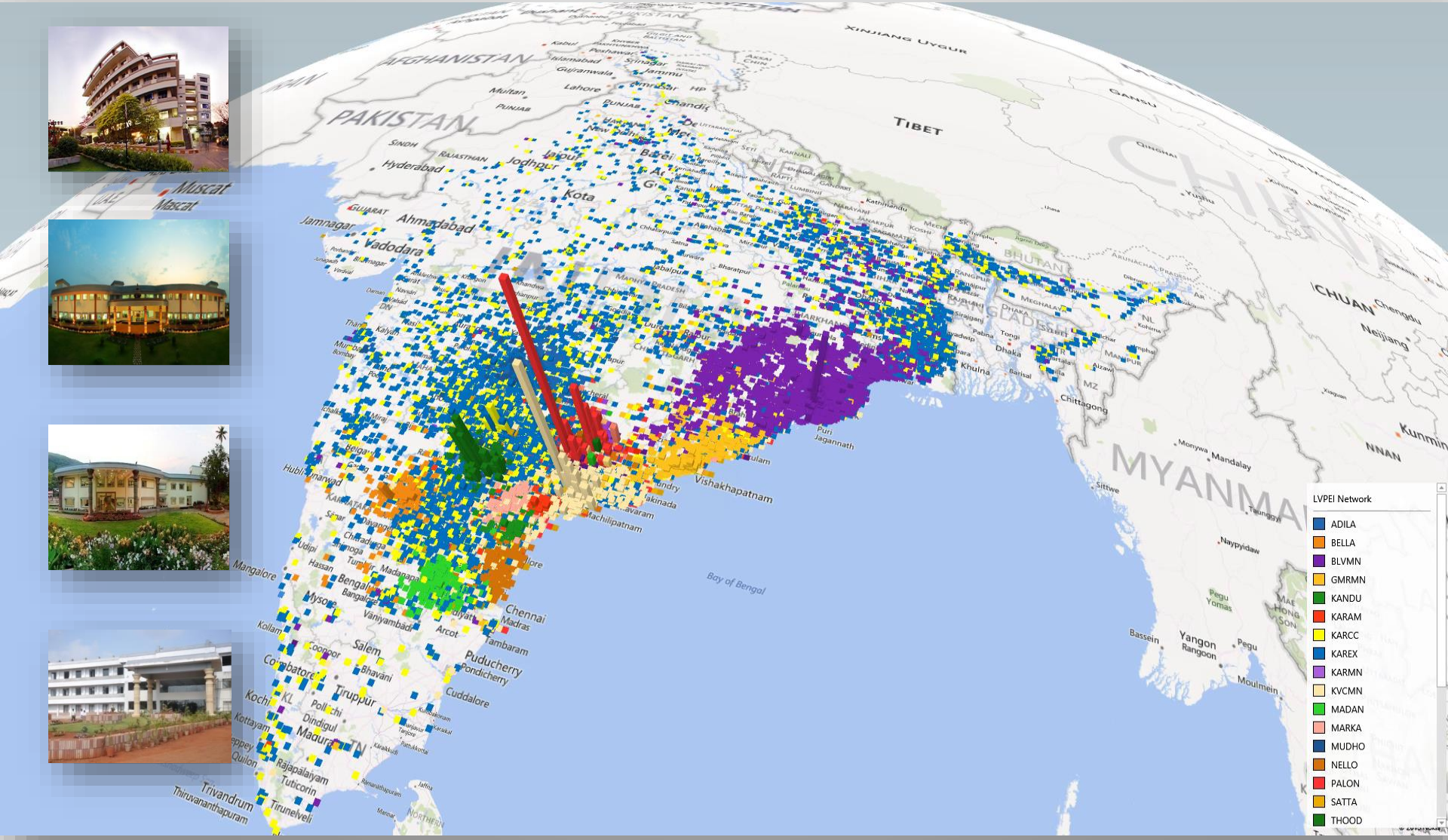

5 Million Consults and counting...

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1st revolution
Water/Steam

1784

2nd revolution
Electricity

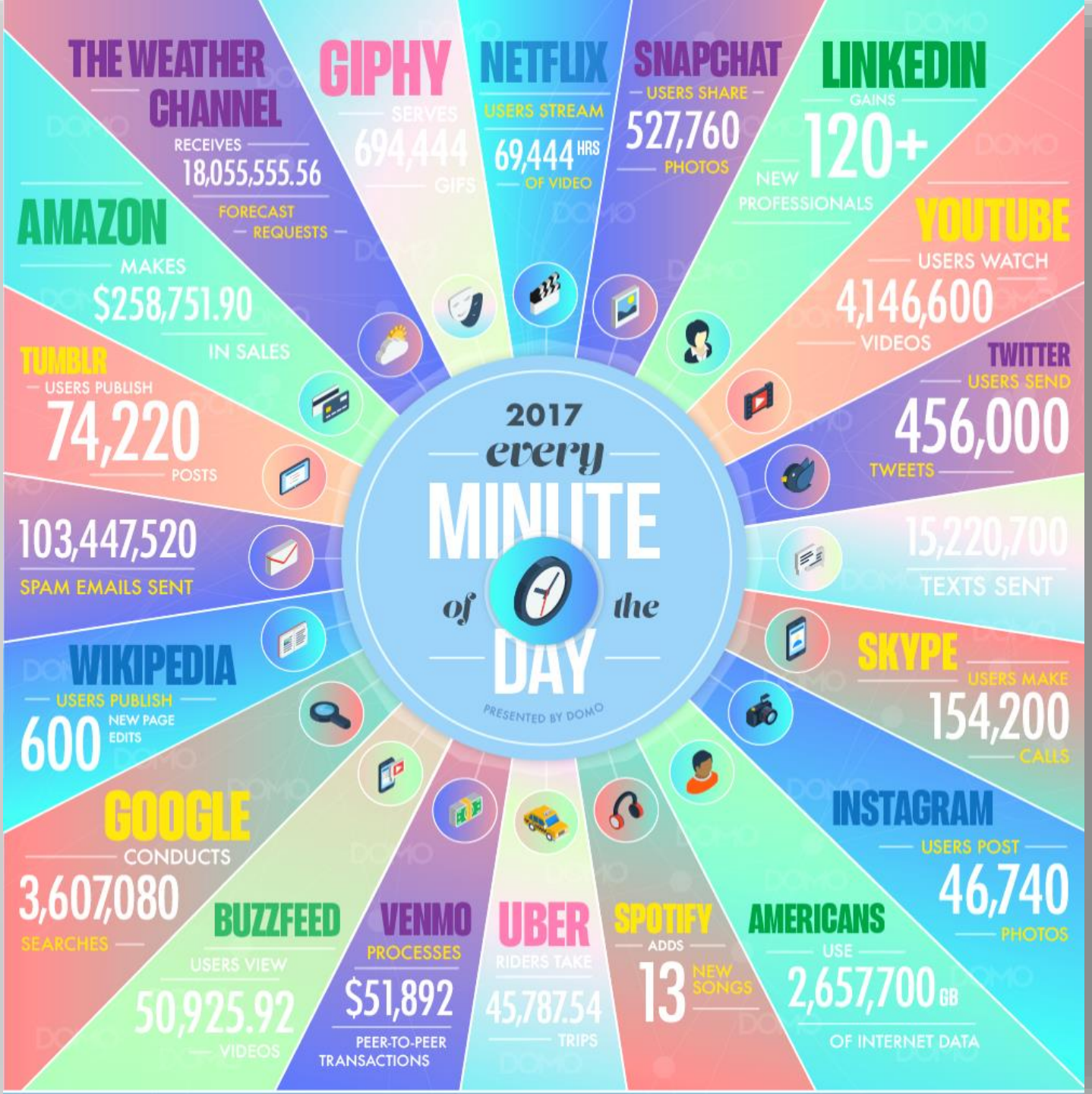
1870

3rd revolution
Automation

1969

4th revolution
Cyberphysical systems

2000


2017
every
MINUTE
of the
DAY
PRESENTED BY DOMO
THE WEATHER CHANNEL
RECEIVES
18,055,555.56
FORECAST REQUESTS
GIPHY
SERVES
694,444
GIFS
NETFLIX
USERS STREAM
69,444 HRS
OF VIDEO
SNAPCHAT
USERS SHARE
527,760
PHOTOS
LINKEDIN
GAINS
120+
NEW PROFESSIONALS
AMAZON
MAKES
$258,751.90
IN SALES
YOUTUBE
USERS WATCH
4,146,600
VIDEOS
TUMBLR
USERS PUBLISH
74,220
POSTS
TWITTER
USERS SEND
456,000
TWEETS
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15,220,700
TEXTS SENT
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USERS PUBLISH
600 NEW PAGE EDITS
SKYPE
USERS MAKE
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CALLS
GOOGLE
CONDUCTS
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SEARCHES
INSTAGRAM
USERS POST
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VENMO
PROCESSES
$51,892
PEER-TO-PEER TRANSACTIONS
UBER
RIDERS TAKE
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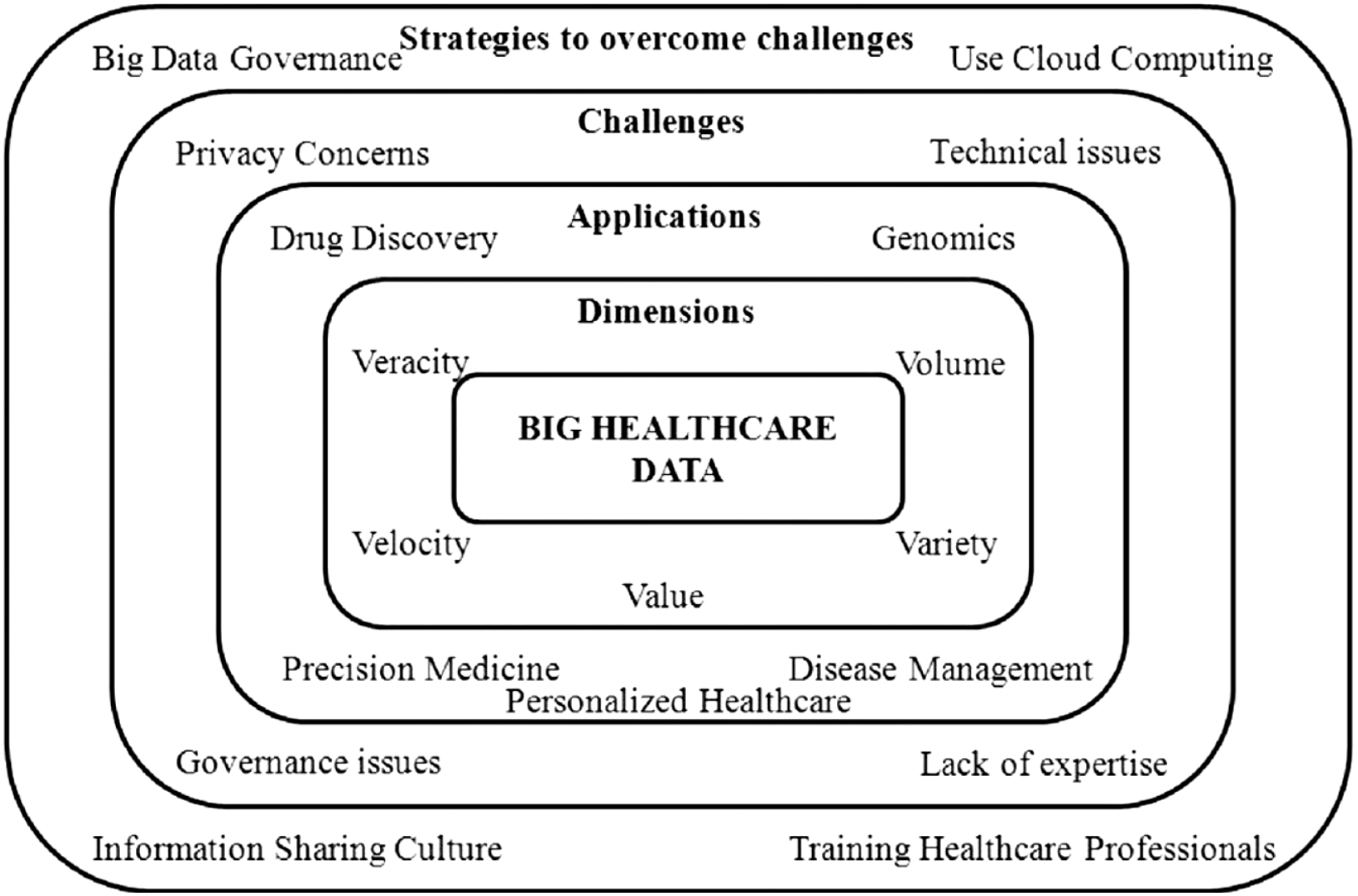
TRIPS
SPOTIFY
ADDS
13 NEW SONGS
AMERICANS
USE
2,657,700 GB
OF INTERNET DATA


Strategies to overcome challenges
Big Data Governance
Use Cloud Computing
Challenges
Privacy Concerns
Technical issues
Applications
Drug Discovery
Genomics
Dimensions
Veracity
Volume
BIG HEALTHCARE DATA
Velocity
Variety
Value
Precision Medicine
Disease Management
Personalized Healthcare
Governance issues
Lack of expertise
Information Sharing Culture
Training Healthcare Professionals

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Can Research be in REAL TIME?

Bridging the GAP in Human Understanding

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Asking the Question

Disease Progression

Image Analysis

Surgical Outcomes Prediction

OPD Forecasting

Population Health

H-K-M-B-T

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Tools for Analysis

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Continuous Data Pipelines

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Govindram Seksaria Institute of Dacryology
L V Prasad Eye Institute

YEAR COUNT	AVERAGE AGE	COUNTRY	LOCATION
1	40.73	12	3722

AEye Data Pipeline Jan 2018

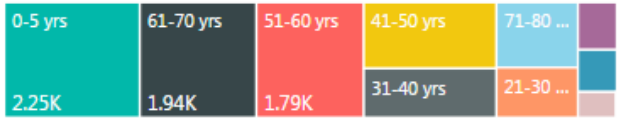
LV Prasad Eye Institute

NUMBER OF PATIENTS

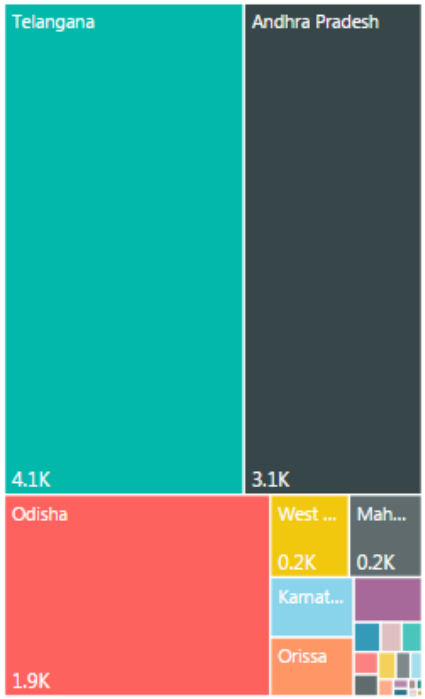
10.19K

YEAR FILTER

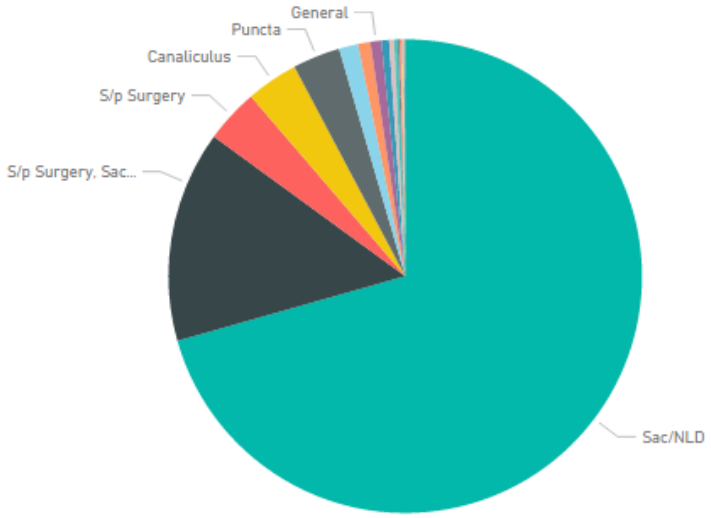
AGE GROUP



STATE FILTER



DIAGNOSIS DISTRIBUTION



GENDER DISTRIBUTION

AEye Pipeline

eyeSmart Rural App (N=501,771)

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eyeSmart EMR App - AEye Link
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Doorstep to Boardroom

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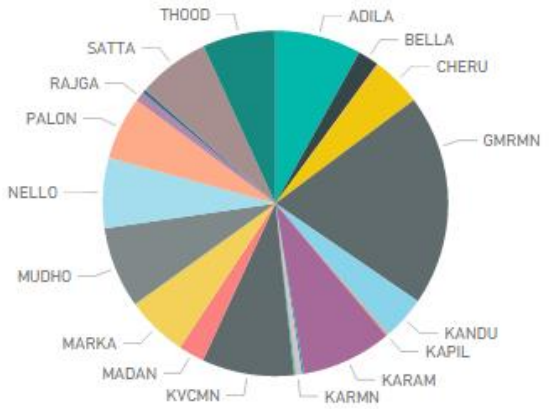
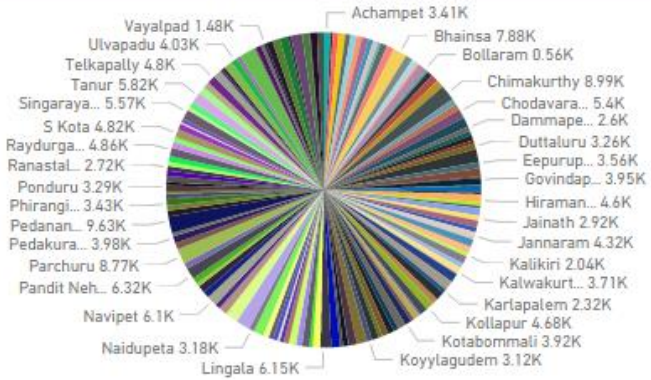
PATIENT COUNT	REFERRAL COUNT
563.36K	76.98K

LOCATION COUNT	MANDAL COUNT
5946	736

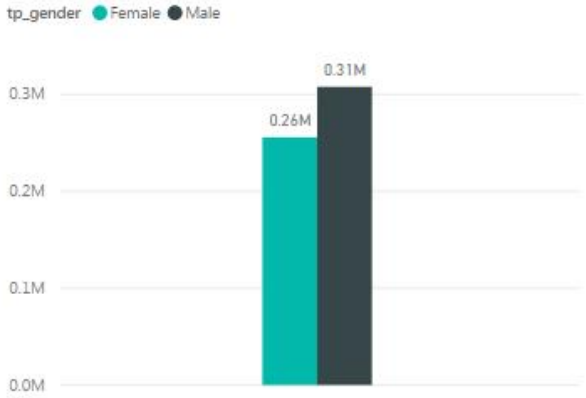
VILLAGE VISION COMPLEX DISTRIBUTION



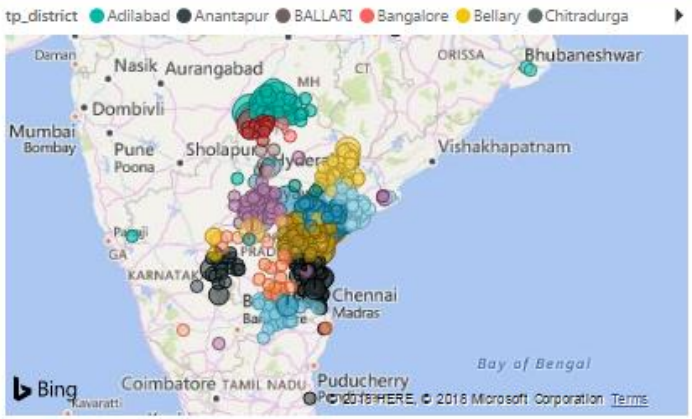
VISION CENTER DISTRIBUTION



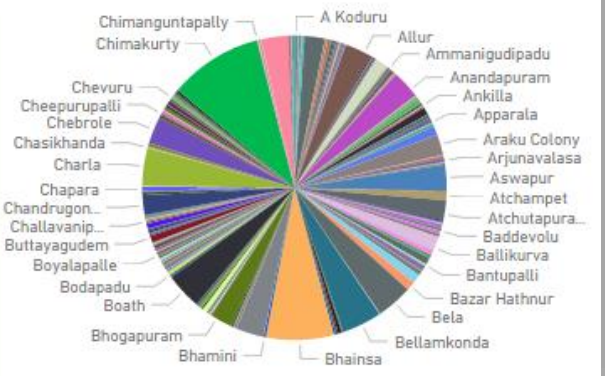
GENDER DISTRIBUTION



MANDAL DISTRIBUTION



LOCATION DISTRIBUTION



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Liberia Eye Center
Monrovia
L V Prasad Eye Institute

YEAR COUNT	AVERAGE AGE	COUNTY	LOCATION
2	47.44	16	972

AEye Data Pipeline
Jul 2017

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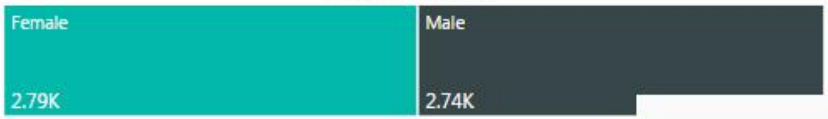
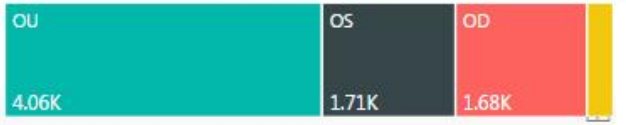
NUMBER OF PATIENTS

5529

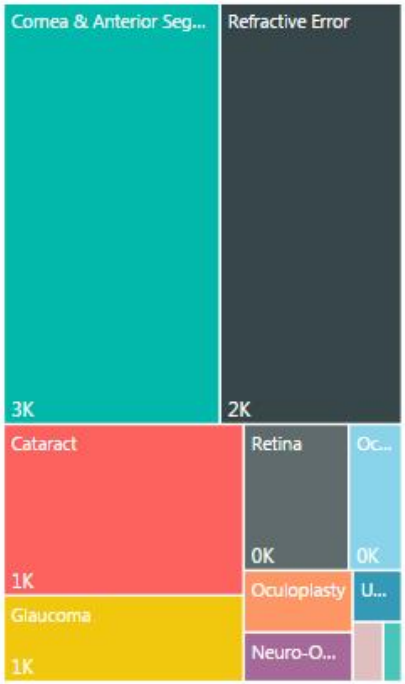
GENDER FILTER



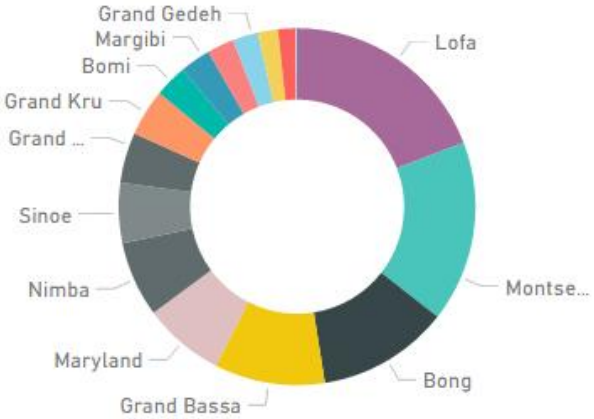
EYE AFFECTED



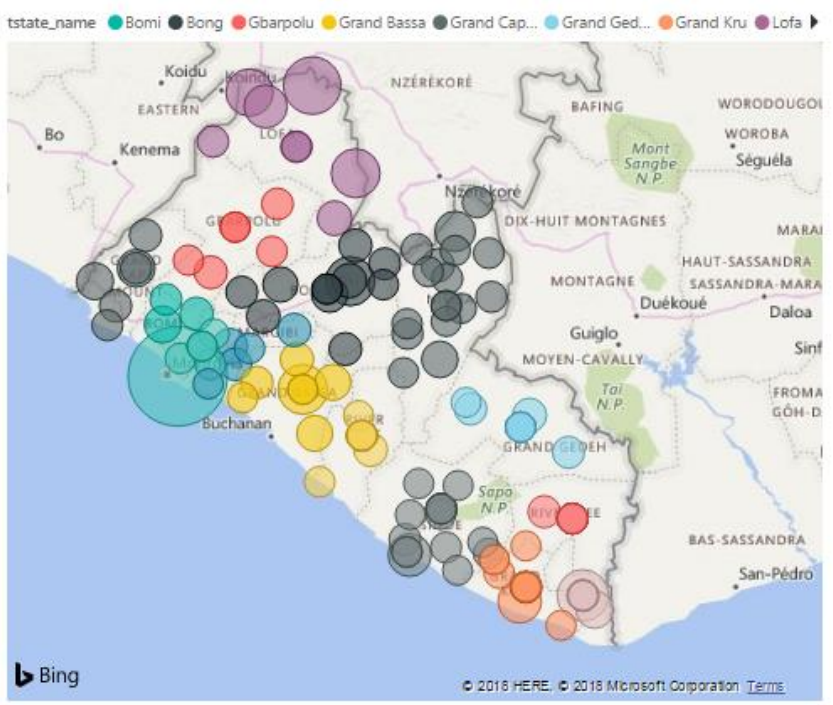
DIAGNOSIS DISTRIBUTION



COUNTY DISTRIBUTION



GEOGRAPHIC DISTRIBUTION



AEye Pipeline

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ORIGINAL INVESTIGATION

The Incidence of Lacrimal Drainage Disorders Across a Tertiary Eye Care Network: Customization of an Indigenously Developed Electronic Medical Record System—eyeSmart

Anthony Vipin Das, F.R.C.S., M.D., Suryasnata Rath, F.R.C.S., M.D.†, Milind N. Naik, M.D.†, and Mohammad Javed Ali, F.R.C.S., Ph.D.†*

**Department of eyeSmart EMR & AEye, and †Govindram Seksaria Institute of Dacryology, L.V.Prasad Eye Institute, Hyderabad, India*

Lacrimal Disorders

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TABLE 1. Incidence of lacrimal drainage disorders by diagnosis

Diagnosis	No. of patients (%)
1. Primary acquired nasolacrimal duct obstruction	10,364 (51.56)
2. Congenital nasolacrimal duct obstruction	5394 (26.83)
3. Acute dacryocystitis	1074 (5.34)
4. Punctal stenosis	603 (3.00)
5. Failed external DCR elsewhere	460 (2.29)
6. Secondary acquired lacrimal duct obstruction	298 (1.48)
7. Functional epiphora	271 (1.35)
8. Failed endoscopic DCR elsewhere	235 (1.17)
9. Lacrimal abscess	194 (0.97)
10. Bicanalicular obstruction	182 (0.91)
11. Canaliculitis	163 (0.81)
12. Canalicular laceration	109 (0.54)
13. Punctal agenesis	101 (0.50)
14. Isolated lower canalicular obstruction	75 (0.37)
15. Acquired lacrimal fistula	72 (0.36)
16. Congenital lacrimal fistula	65 (0.32)
17. Common canalicular obstruction	60 (0.30)
18. Canalicular stenosis	54 (0.27)
19. Isolated upper canalicular obstruction	50 (0.25)
20. Incomplete punctal canalization	43 (0.21)
21. Peripunctal lesions	37 (0.18)
22. Atonic lacrimal sac	36 (0.18)
23. Failed dacryocystectomy elsewhere	22 (0.11)
24. Punctal ectropion	20 (0.10)
25. Failed laser DCR elsewhere	19 (0.09)
26. Rare punctal disorders	19 (0.09)
27. Canalicular wall dysgenesis	18 (0.09)
28. Lacrimal sac tumors	17 (0.08)
29. Lacrimal sac diverticula	17 (0.08)
30. Lacrimal sac dacryoliths	16 (0.08)
31. Centurion syndrome	10 (0.05)
32. Hemolacria	4 (0.02)

DCR, Dacryocystorhinostomy.

Key Insights

32 Diseases

No Laterality

2/3rd Females

20,102 patients

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1.45 Million

Rao Donthineni, Pragnya & Kammari, Priyanka & Shanbhag, Swapna & Singh, Vivek & Vipin Das, Anthony & Basu, Sayan. (2019). Incidence, demographics, types and risk factors of dry eye disease in India: Electronic medical records driven big data analytics report I. The Ocular Surface. 10.1016/j.jtos.2019.02.007.

Dry Eye Disease (N=21,290)

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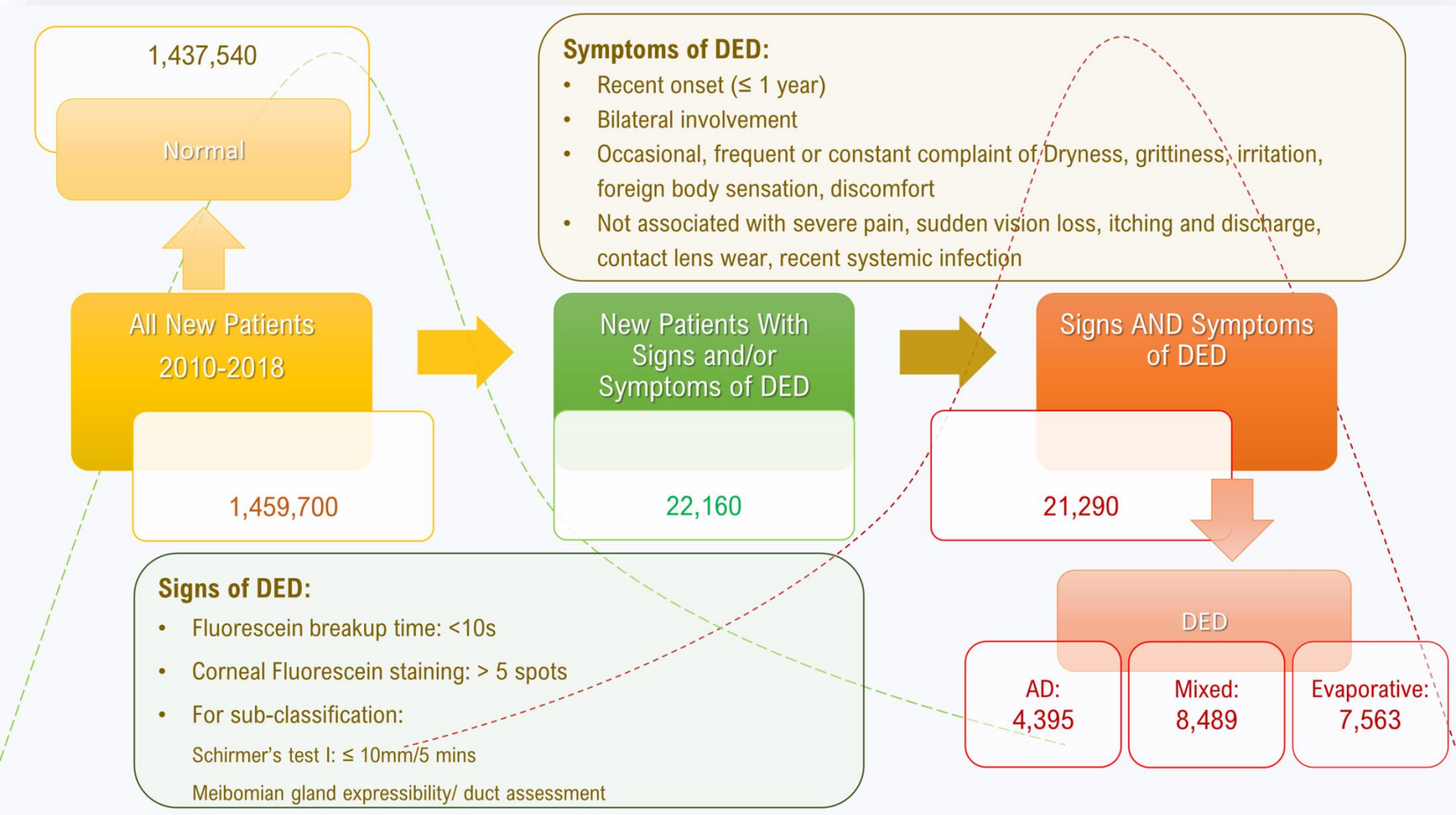

Professional Work (OR 1.5), Affluence (OR 1.6-3.2)

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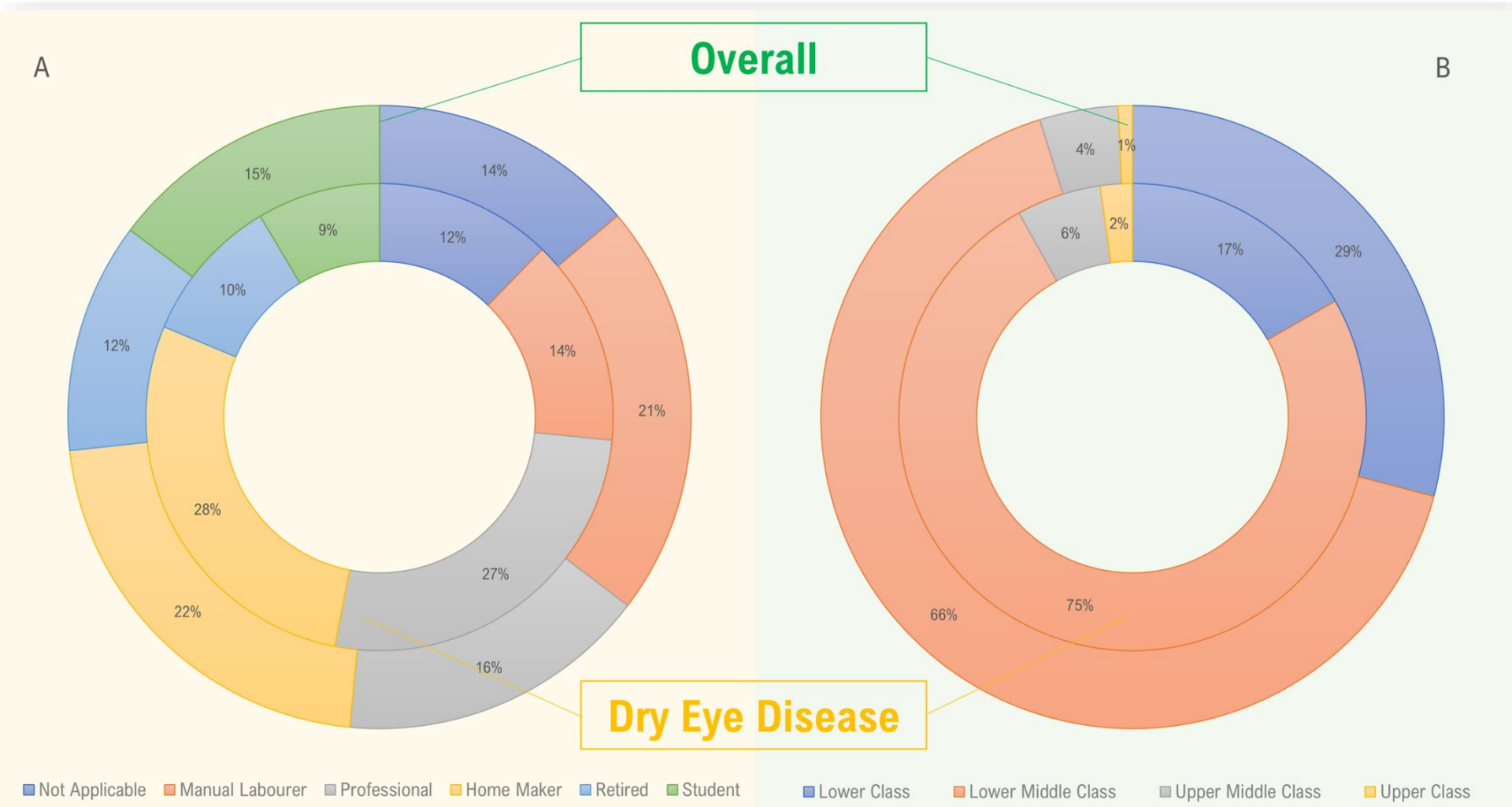

Bimodal Distribution (Gender)

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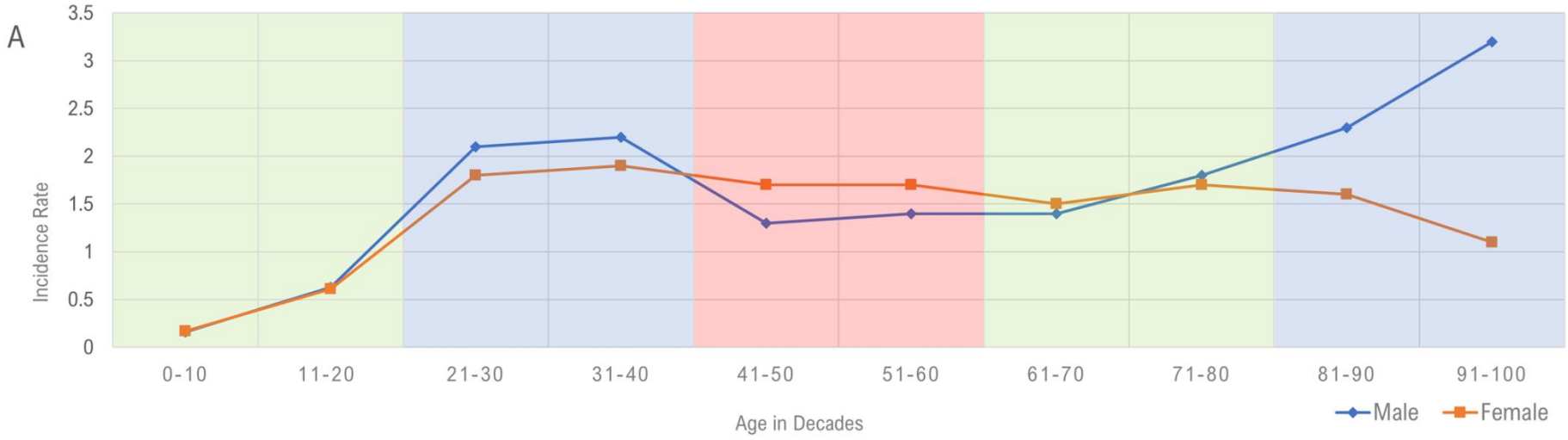

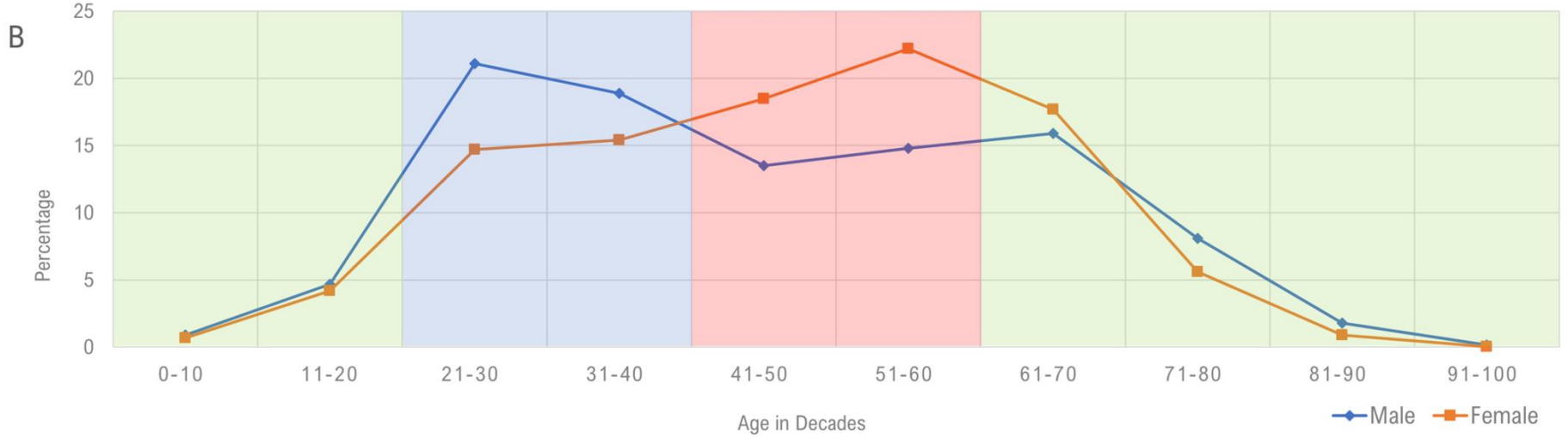

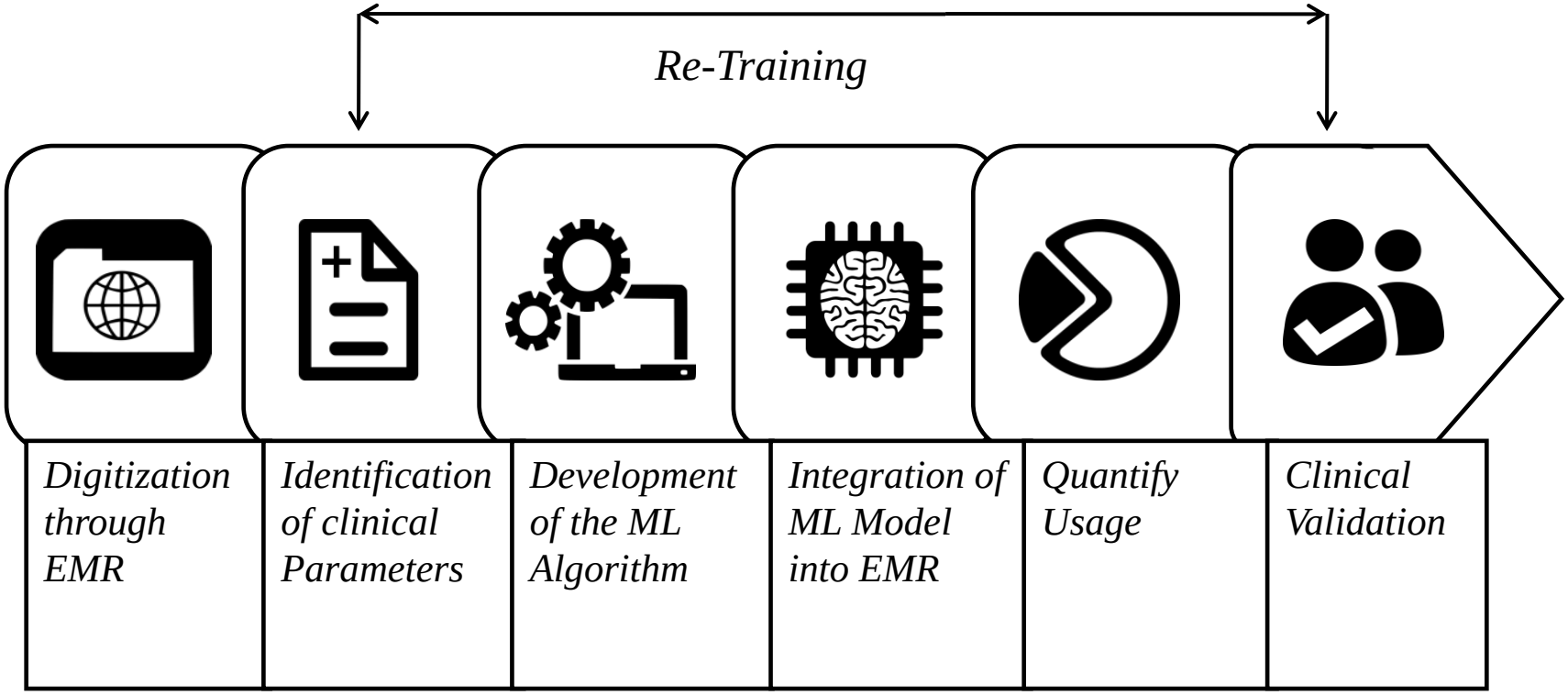

The AEye Pipeline

Pavan Verkicharla & Anthony Vipin Das, Community Eye Health. March 2019

Refractive Error Prediction (N=333,000)

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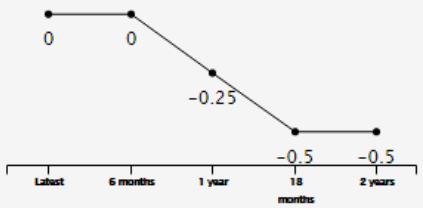
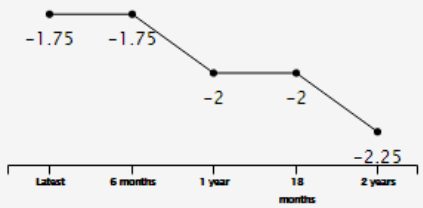
Spherical Forecast

A function of DISTANCE between lenses in the Eye

RIGHT EYE



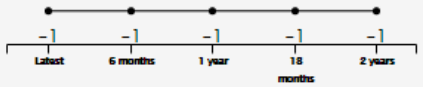
LEFT EYE



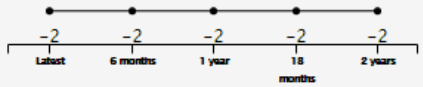
Cylindrical Forecast

A function of the SHAPE of the lenses in the Eye

RIGHT EYE



LEFT EYE



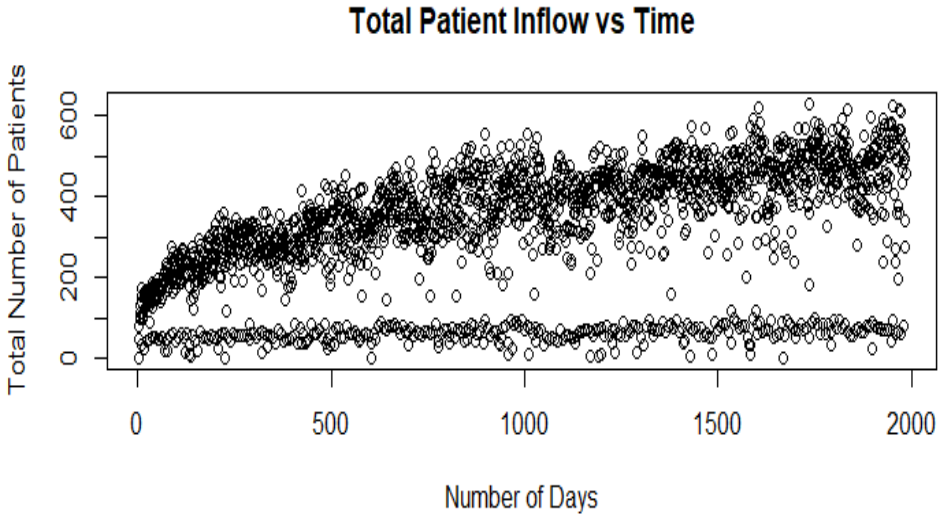
These models are currently in preview and for doctor assistance only. Please read this disclaimer for guidance

Time Period (Print)	RIGHT EYE		LEFT EYE	
	Sph	Cyl	Sph	Cyl
Latest	0	-1	-1.75	-2
6 months	0	-1	-1.75	-2
1 year	-0.25	-1	-2	-2
18 months	-0.5	-1	-2	-2
2 years	-0.5	-1	-2.25	-2

Response Time: 2 seconds

Last Update time: 21-12-2018 12:28 PM

Patient Forecasting (N= 3,384,157)

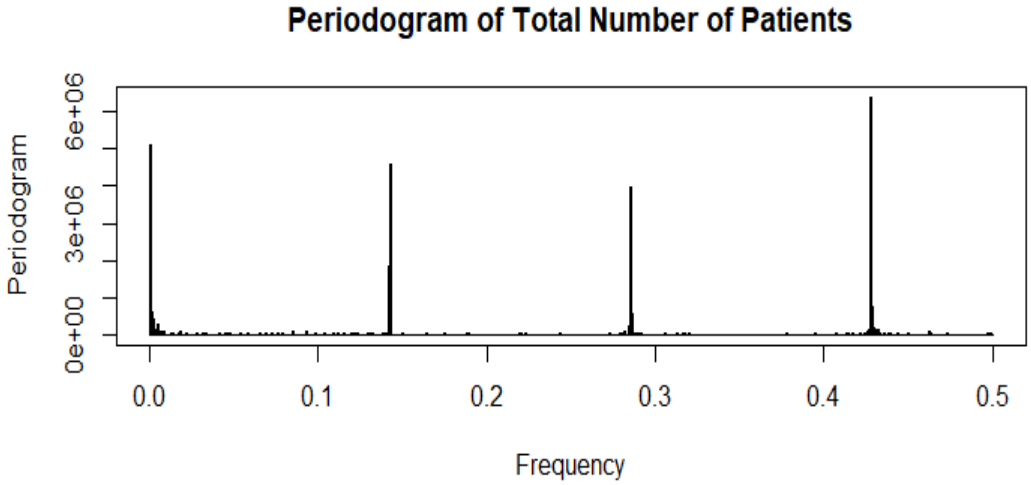


Increasing patient inflow

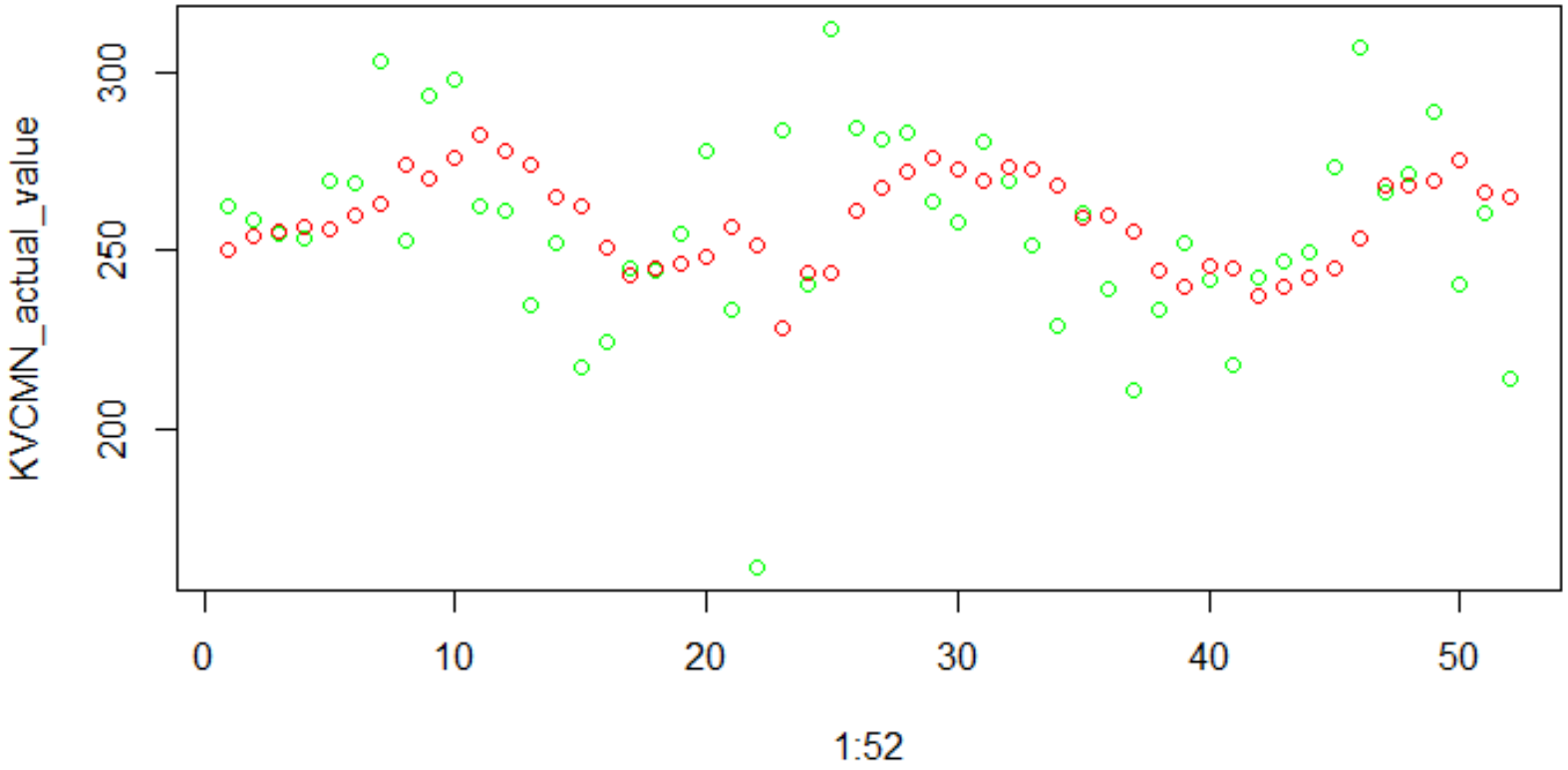
over 8 years

Seasonal pattern

every 7 days



SARIMA Modeling Results



Green = Actual Value ; **Red** = Predicted Value

Prediction Error <20% for 52 weeks - 63% to 96%

GIGO

Current Scenario

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(1) Researchers lack consensus about the operational definition of Big Data in healthcare;

(2) Big Data in healthcare comes from the internal sources within the hospitals or clinics as well external sources including government, laboratories, pharma companies, data aggregators, medical journals etc.;

(3) Natural language processing (NLP) is most widely used Big Data analytical technique for healthcare and most of the processing tools used for analytics are based on Hadoop;

(4) Big Data analytics finds its application for clinical decision support; optimization of clinical operations and reduction of cost of care

(5) Major challenge in adoption of Big Data analytics is non-availability of evidence of its practical benefits in healthcare

Mehta N, Pandit A. Concurrence of big data analytics and healthcare: A systematic review. Int J Med Inform. 2018 Jun;114:57-65. 2018 Mar 26.

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1 Billion

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Data is not information,

Information is not knowledge,

Knowledge is not understanding,

Understanding is not wisdom.

Wisdom is not Impact!


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