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Patent landscape report on Hybrid Beamforming in Massive MIMO systems

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www.cambridge.edu.in

CAMBRIDGE INSTITUTE OF TECHNOLOGY

Domain/topic

- Name of the domain/topic: **Hybrid Beamforming in mmWave massive MIMO systems**
- IPC: H04L 5/00
- Query used as such: mmWave massive MIMO AND Hybrid Beamforming AND RF (analog) precoding

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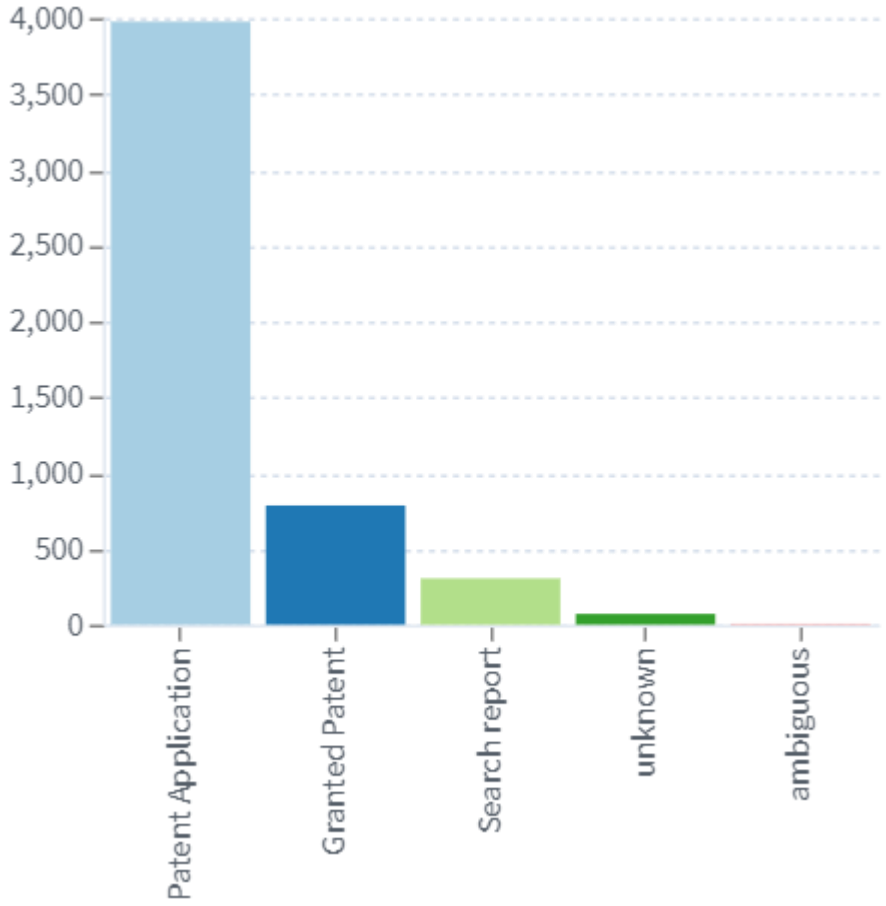
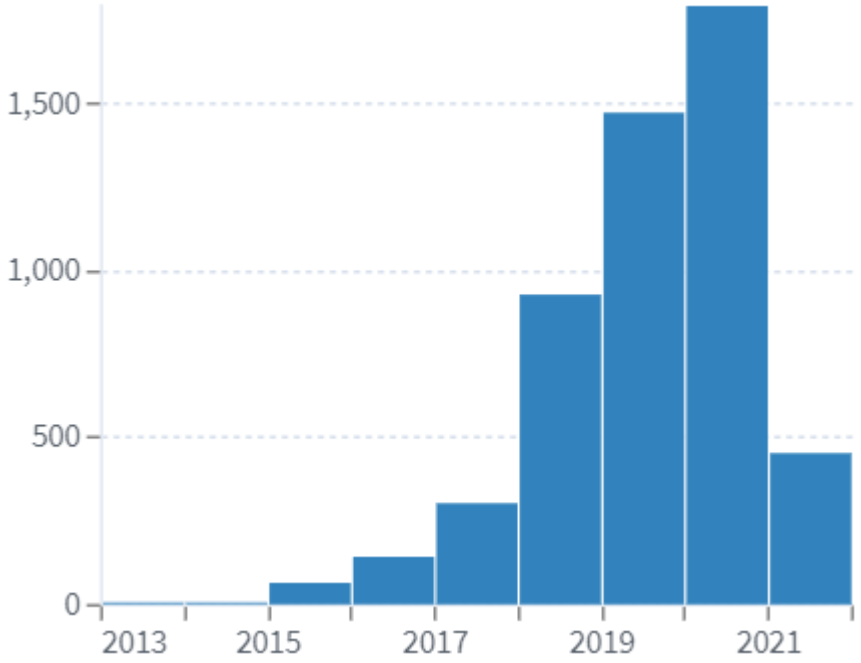
India Vs rest in patent filing in last 20 years





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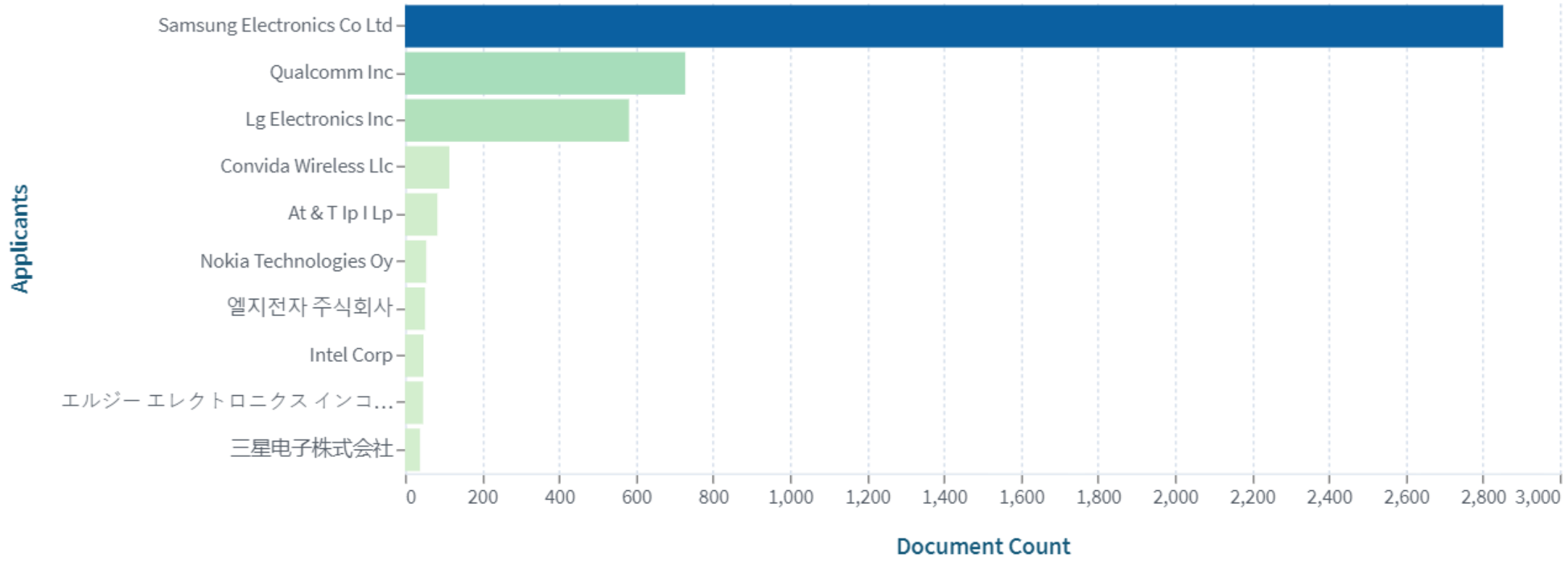
India Vs rest in top ten applicants in last 20 years



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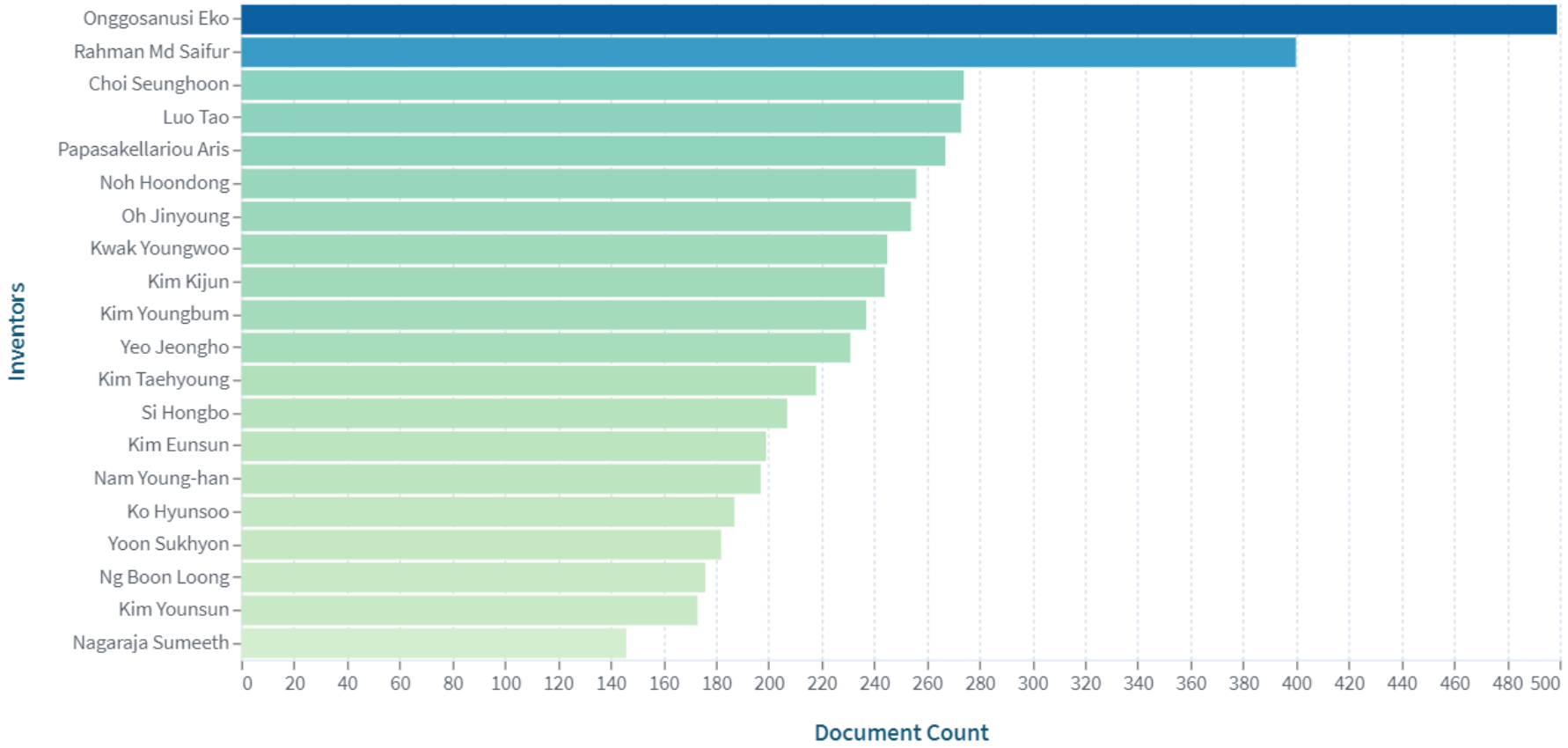
India Vs rest in top ten inventors in last 20 years



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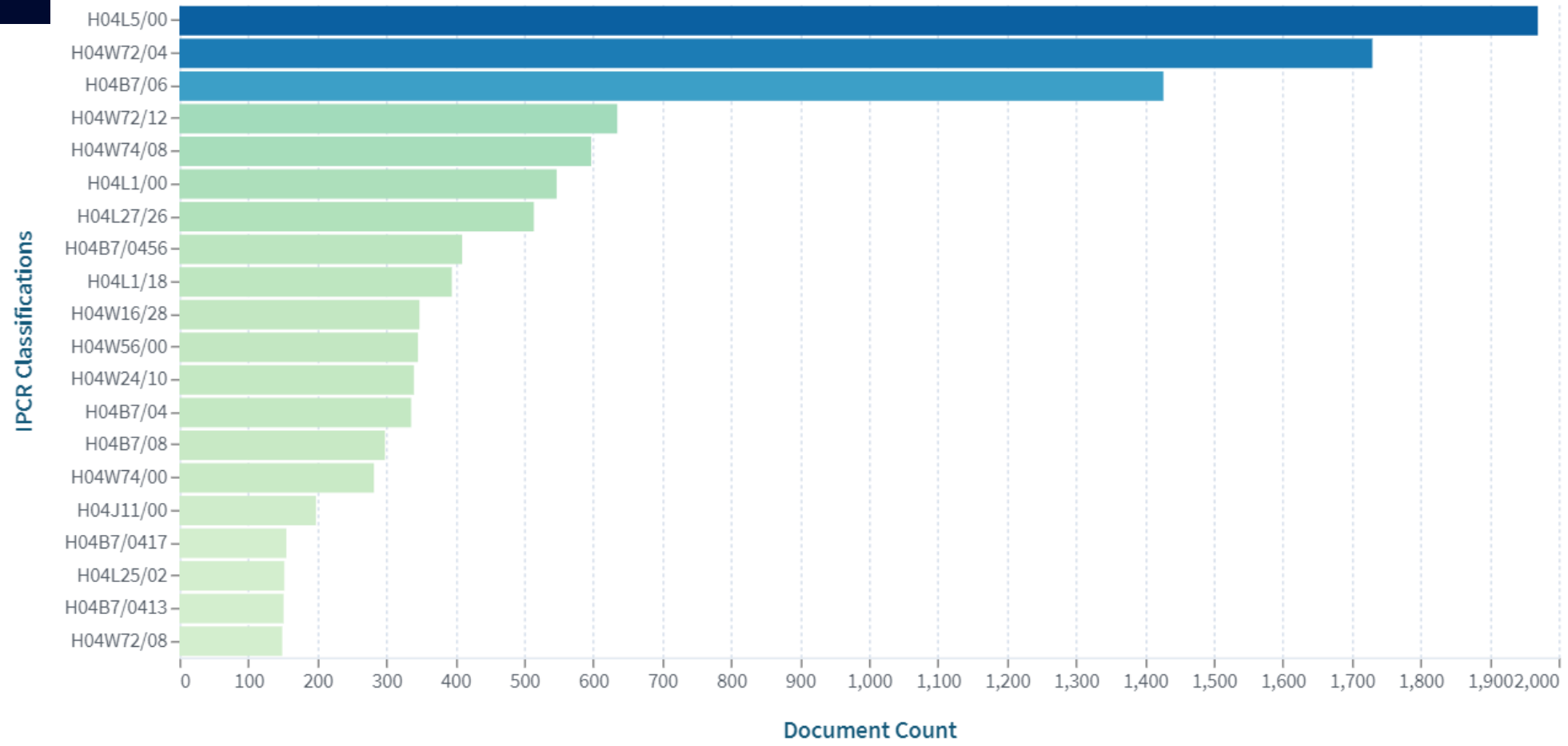
India Vs rest in top ten IPCs in last 20 years



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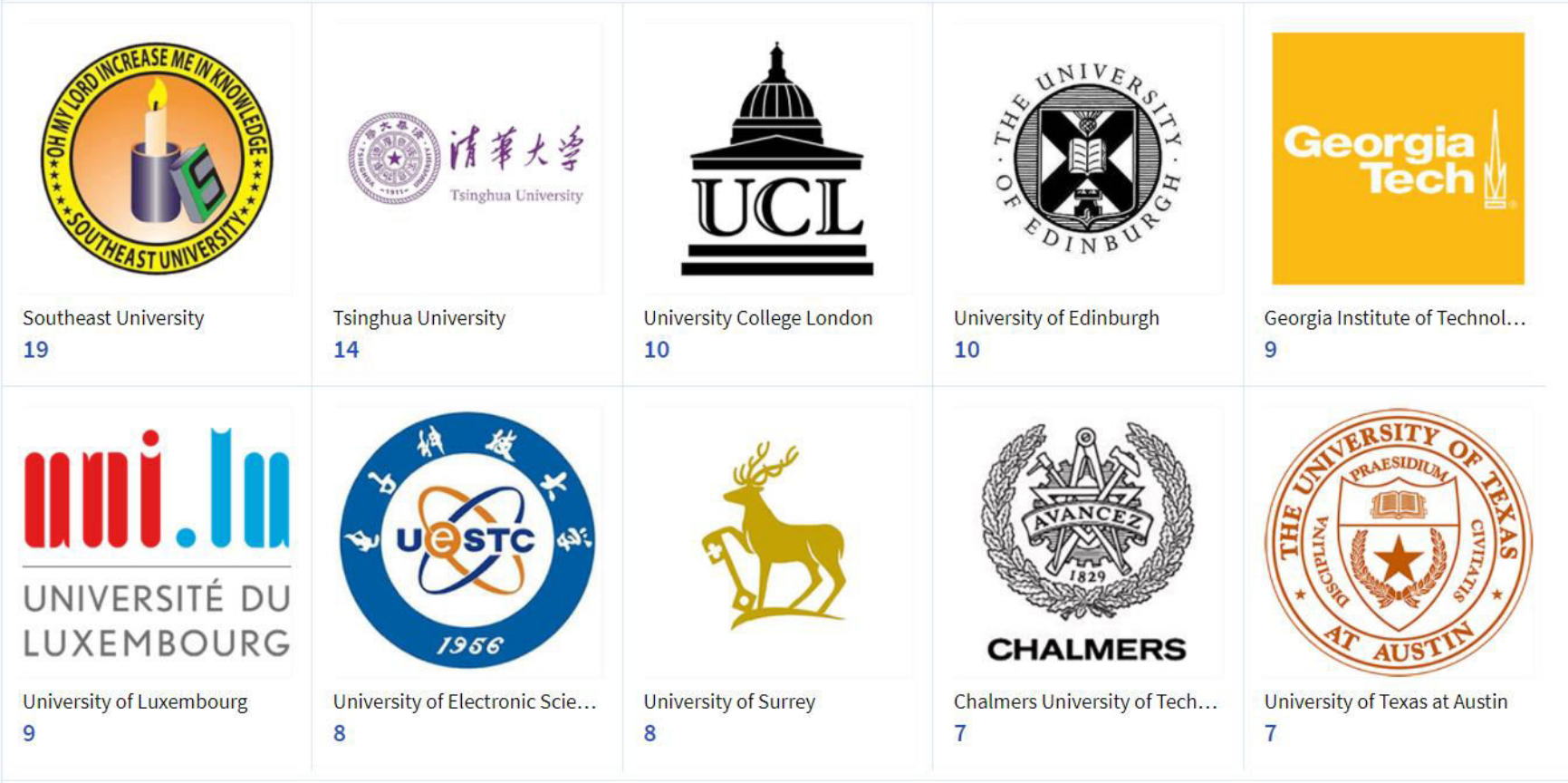
India Vs rest in top ten institutes in last 20 years



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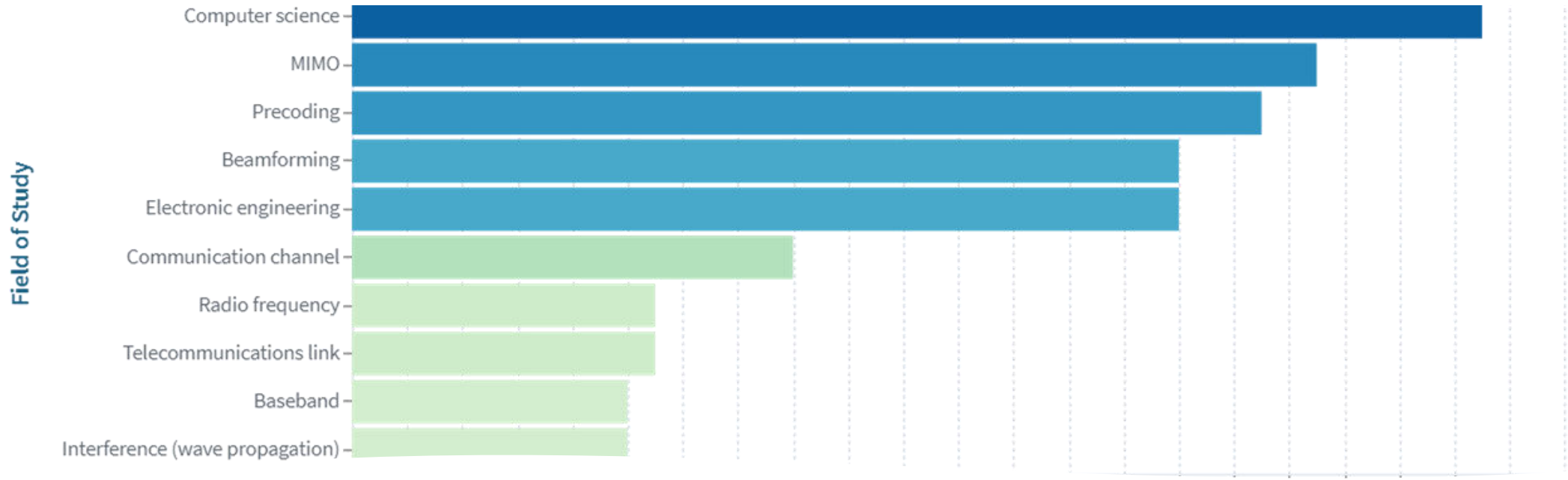

3 Key technologies and IPCs used

- KT1 : MIMO
- KT2: Precoding
- KT3: Beamforming

- IPC1: H04L 5/00
- IPC2:H04W 72/04
- IPC3:H04B 7/06

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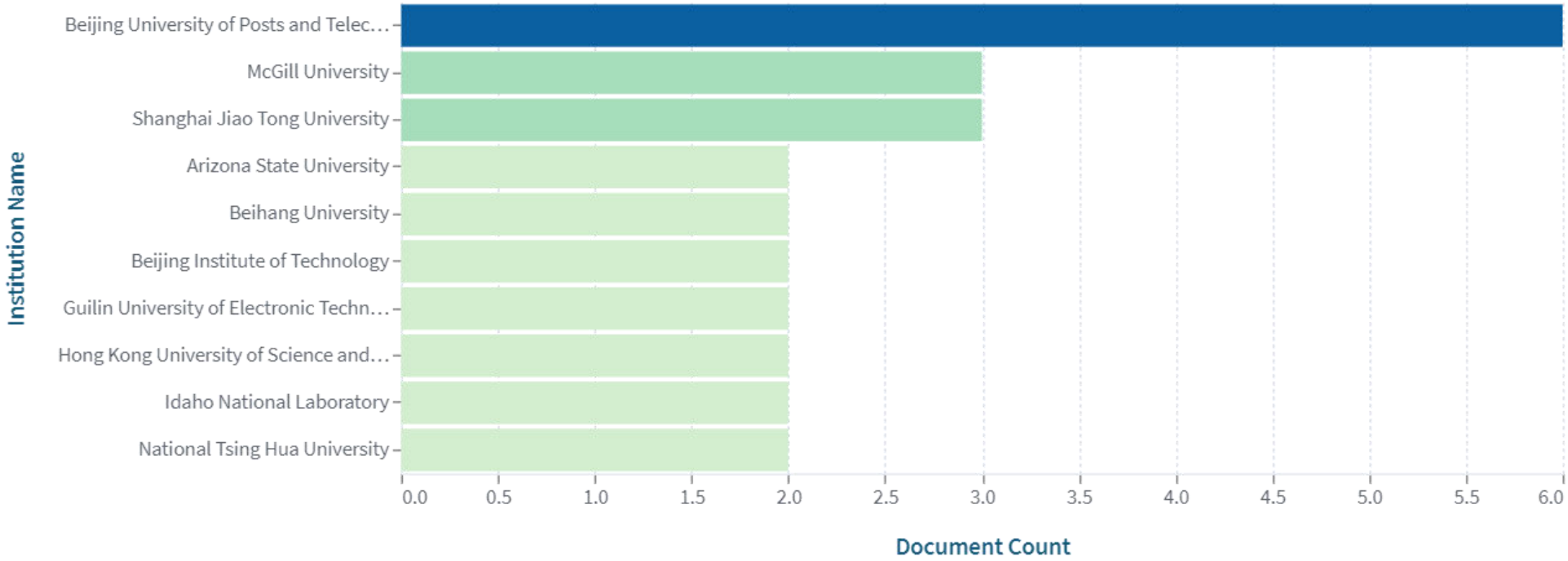
India Vs rest in top ten institutes in last 20 years considering KTs



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Top Indian institutes based on scholarly works

1	GLA University, Mathura
2	TELEFONAKTIEBOLAGET LM ERICSSON (PUBL), Sweden;
3	INDIAN INSTITUTE OF TECHNOLOGY MADRAS (IIT Madras)
4	WISIG NETWORKS PRIVATE LIMITED, Telangana, India
5	QUALCOMM INCORPORATED, USA
6	ERICSSON (CHINA) COMMUNICATIONS COMPANY LTD.
7	HUAWEI TECHNOLOGIES CO. LTD, China
8	Indian Institute of Technology Hyderabad
9	LIANG Ping, USA
10	SAMSUNG ELECTRONICS CO. LTD., Korea
11	LG ELECTRONICS INC.. Korea
12	MEDIATEK SINGAPORE PTE. LTD.

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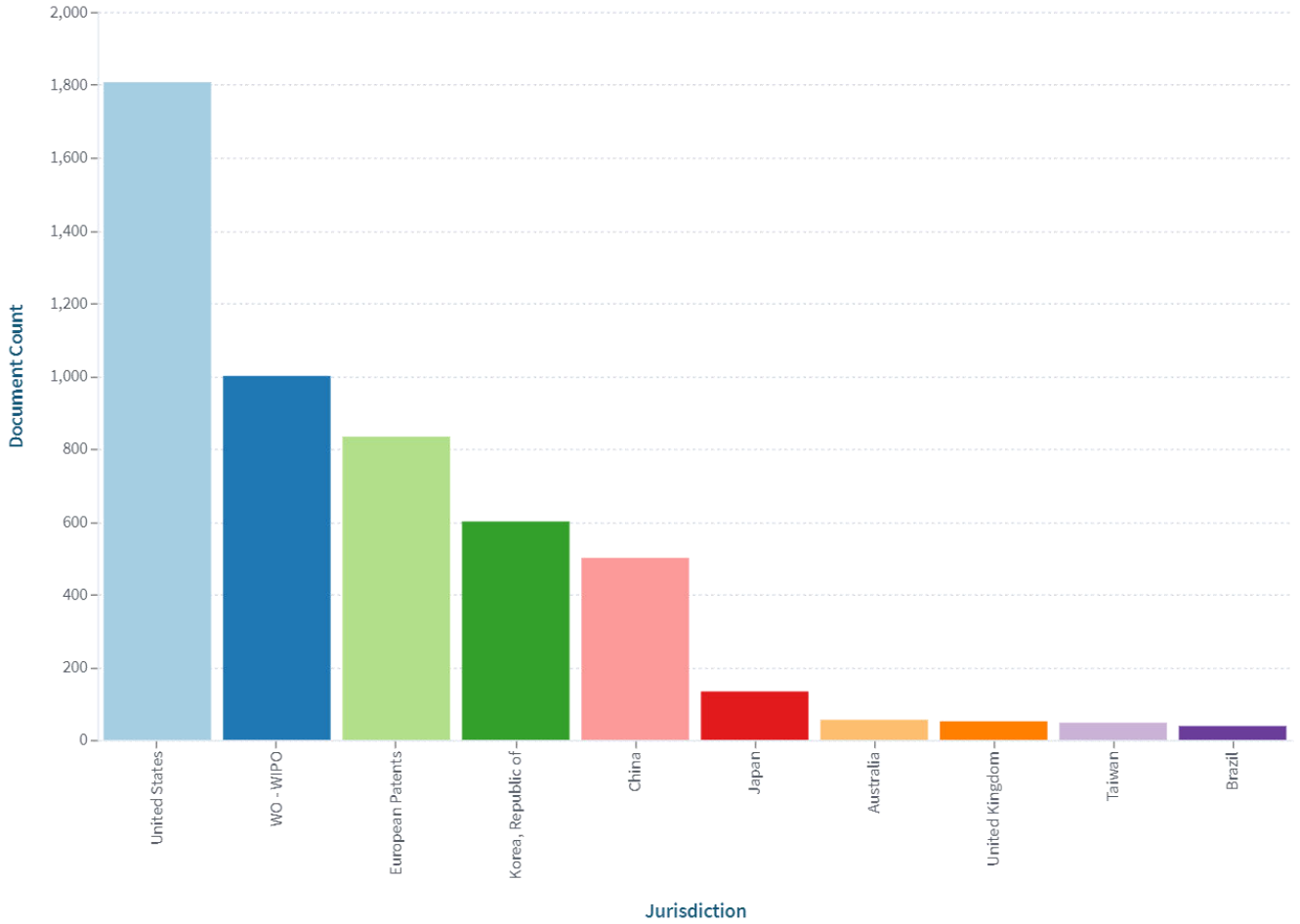
Any slide of your choice



Conclusion on patentability

- Based on the searches performed, it has been concluded on the possibility of a patent filing on the topic

  "Hybrid beamforming in mmWave massive MIMO systems."

- a. Recommended

- The recommendation is based on our understanding:
- A PhD research work

Contact

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  sp.ece@cambridge.edu.in

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Patent landscape report on Sparsity based channel estimation method in mmWave MIMO systems

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Domain/topic

- Name of the domain/topic: Sparsity-based channel estimation for Massive MIMO communication systems
- IPC: H04W72/04
- Query used as such: massive MIMO AND channel estimation AND sparsity

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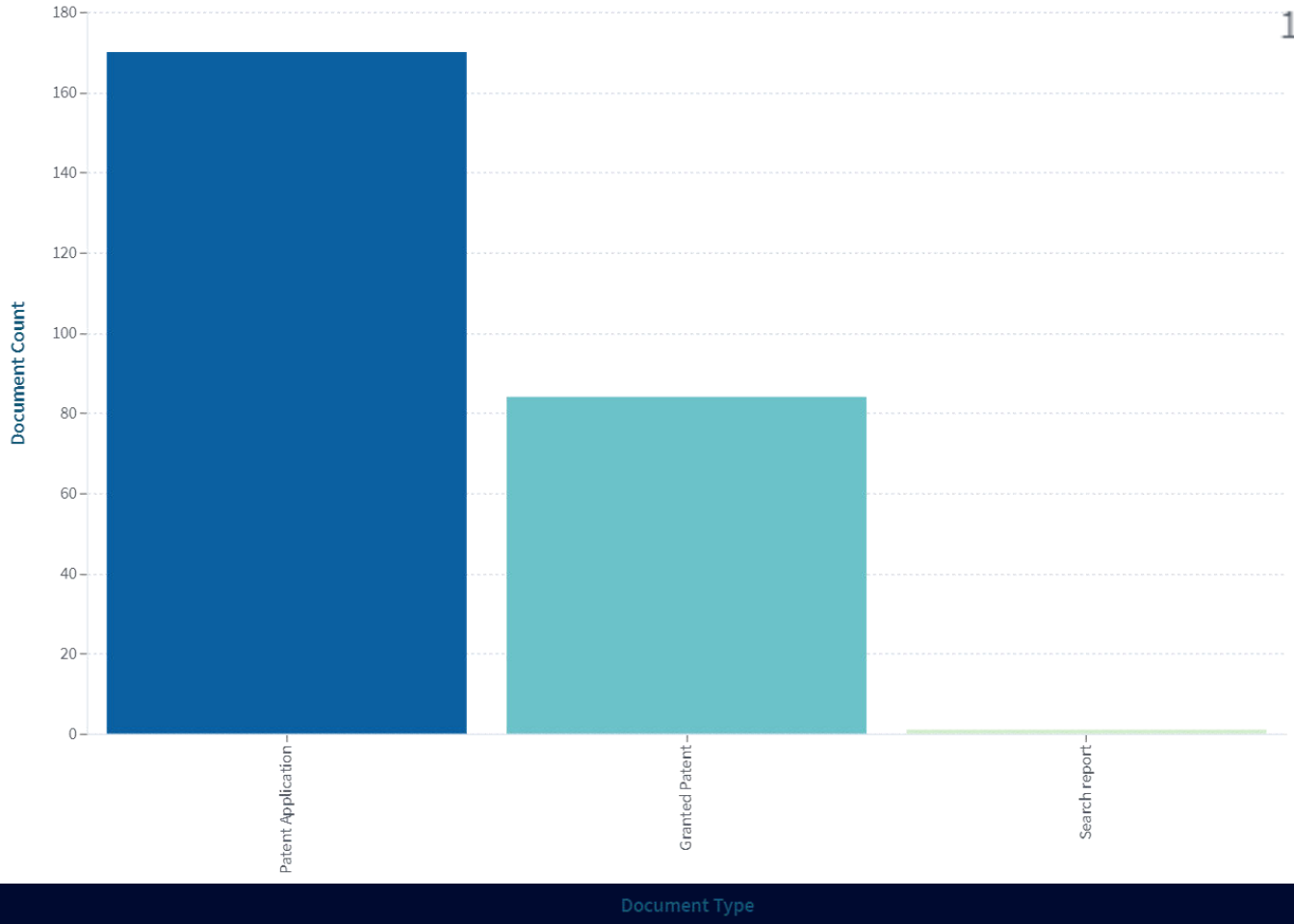
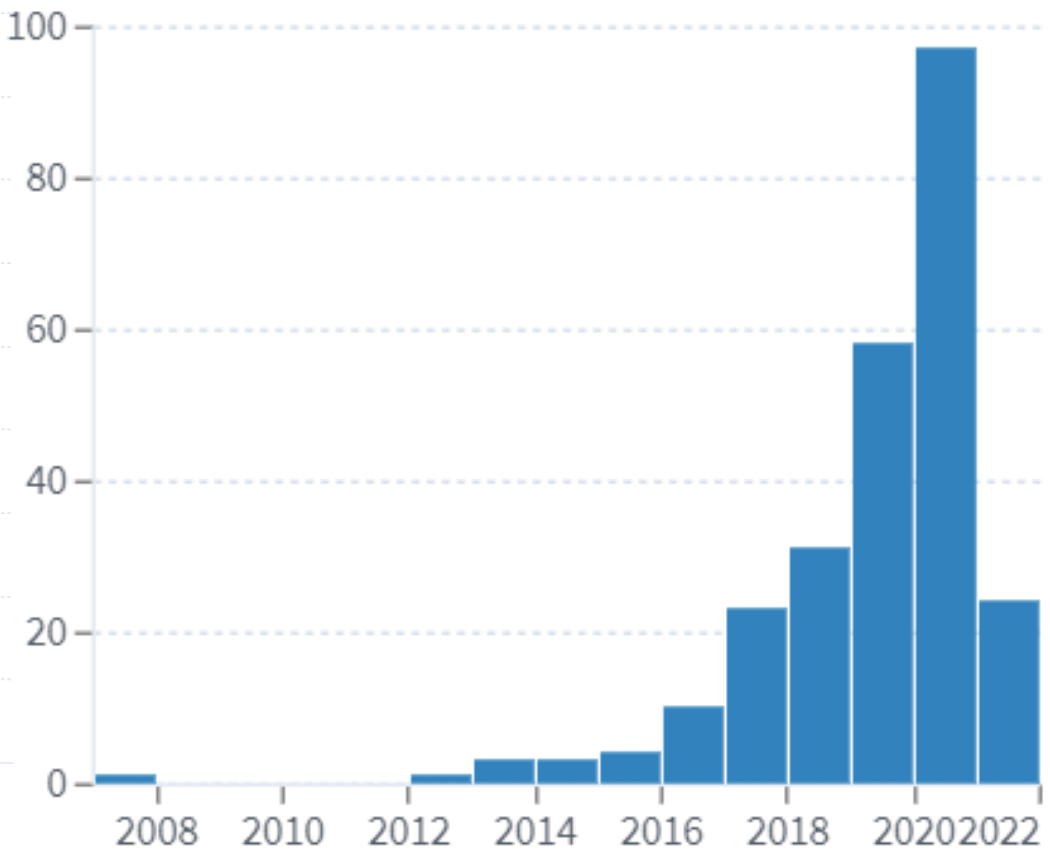
India Vs rest in patent filing in last 20 years





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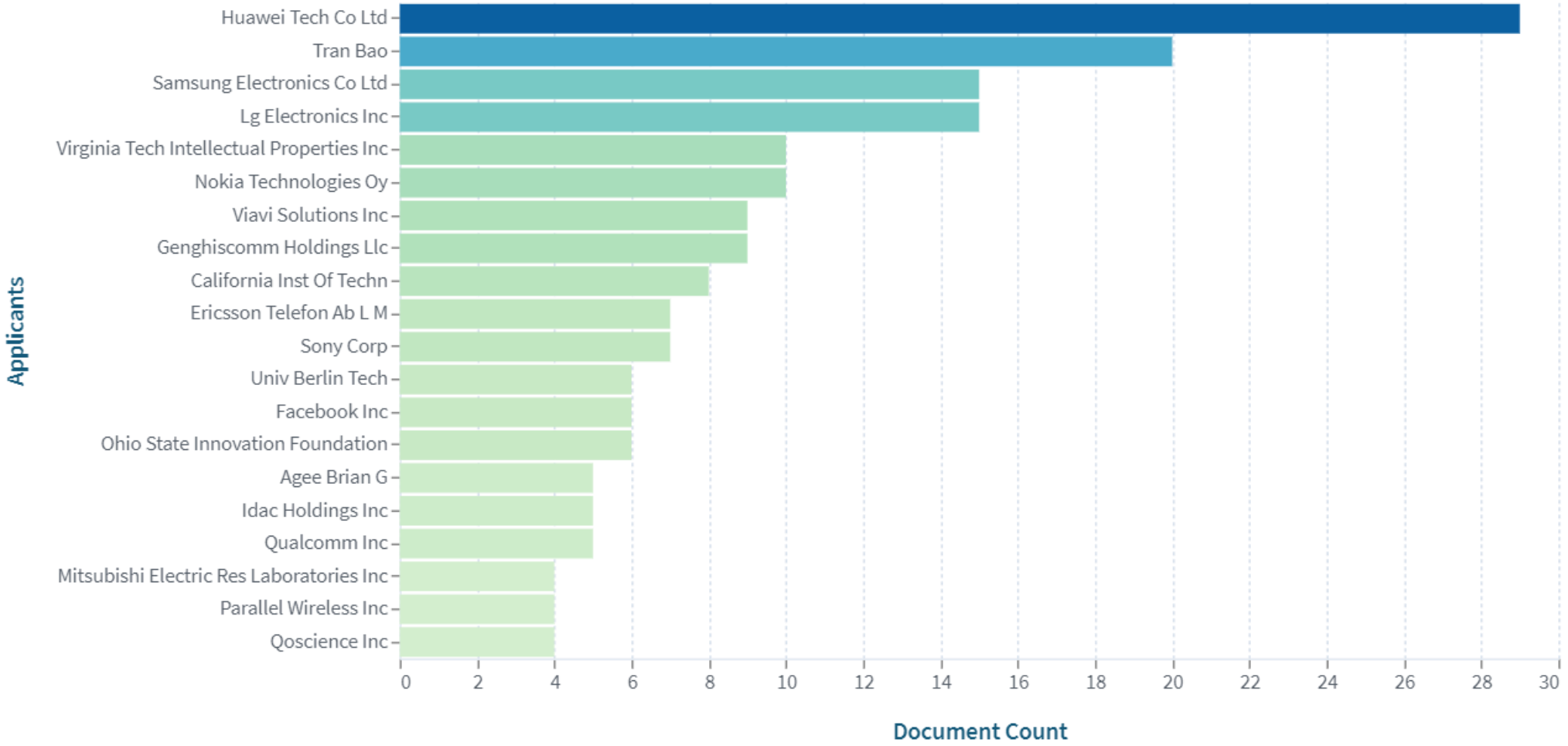
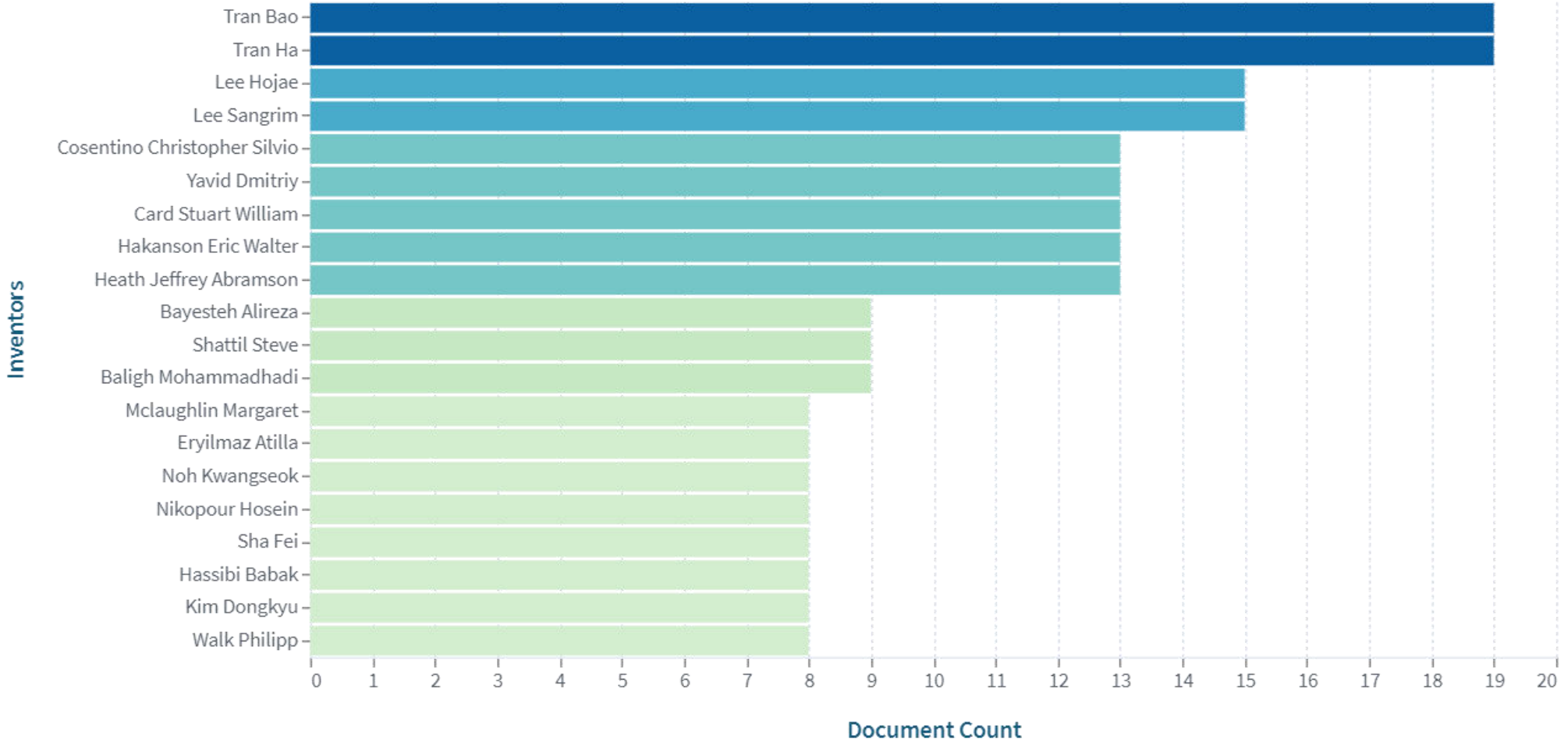
India Vs rest in top ten applicants in last 20 years



CAMBRIDGE INSTITUTE OF TECHNOLOGY

India Vs rest in top ten inventors in last 20 years



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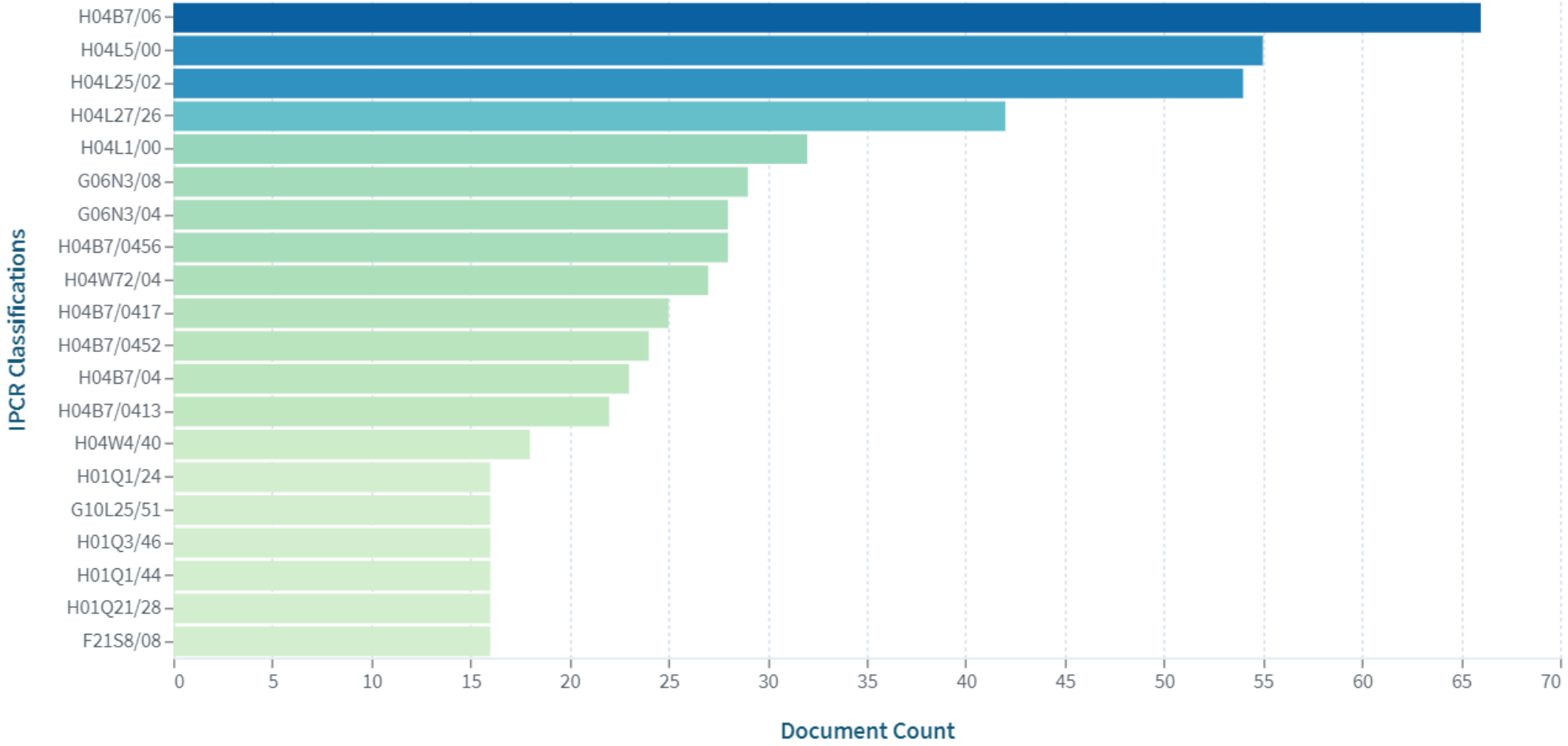
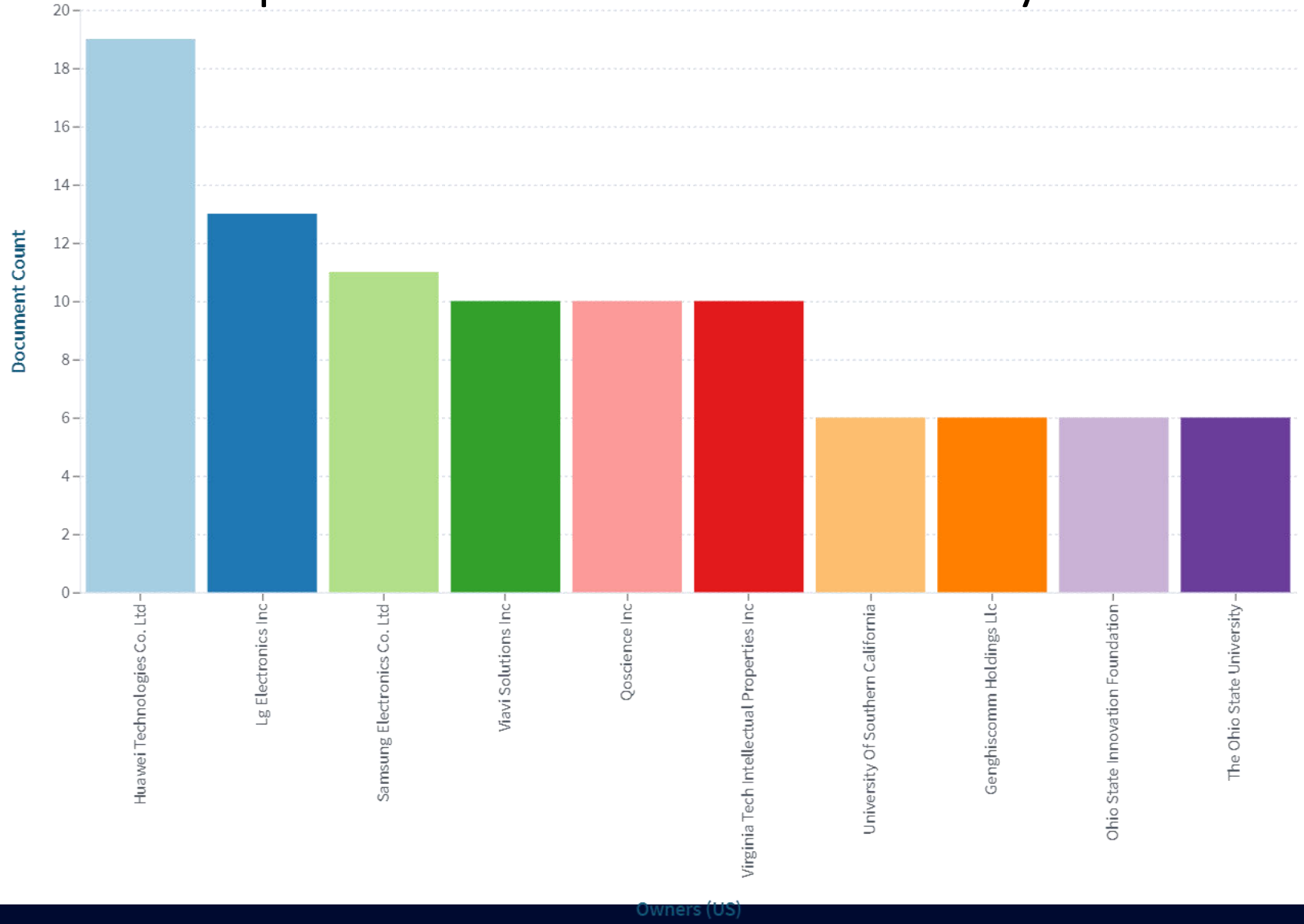
India Vs rest in top ten IPCs in last 20 years



CAMBRIDGE INSTITUTE OF TECHNOLOGY

India Vs rest in top ten institutes in last 20 years



3 Key technologies and IPCs used

- KT1: Massive MIMO Technology
- KT2: Channel estimation Techniques
- KT3: Sparsity-based channel estimation

- IPC1: H04B 7/06
- IPC2:H04L 5/00
- IPC3:H04L 25/02

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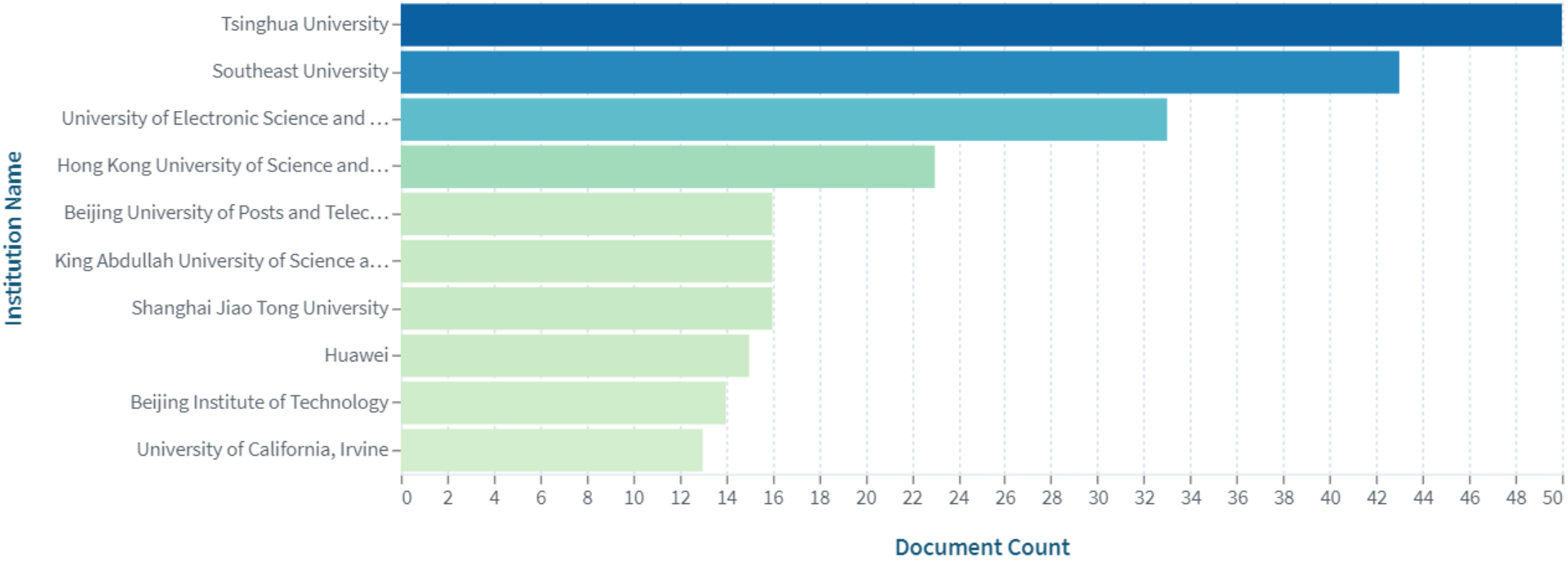
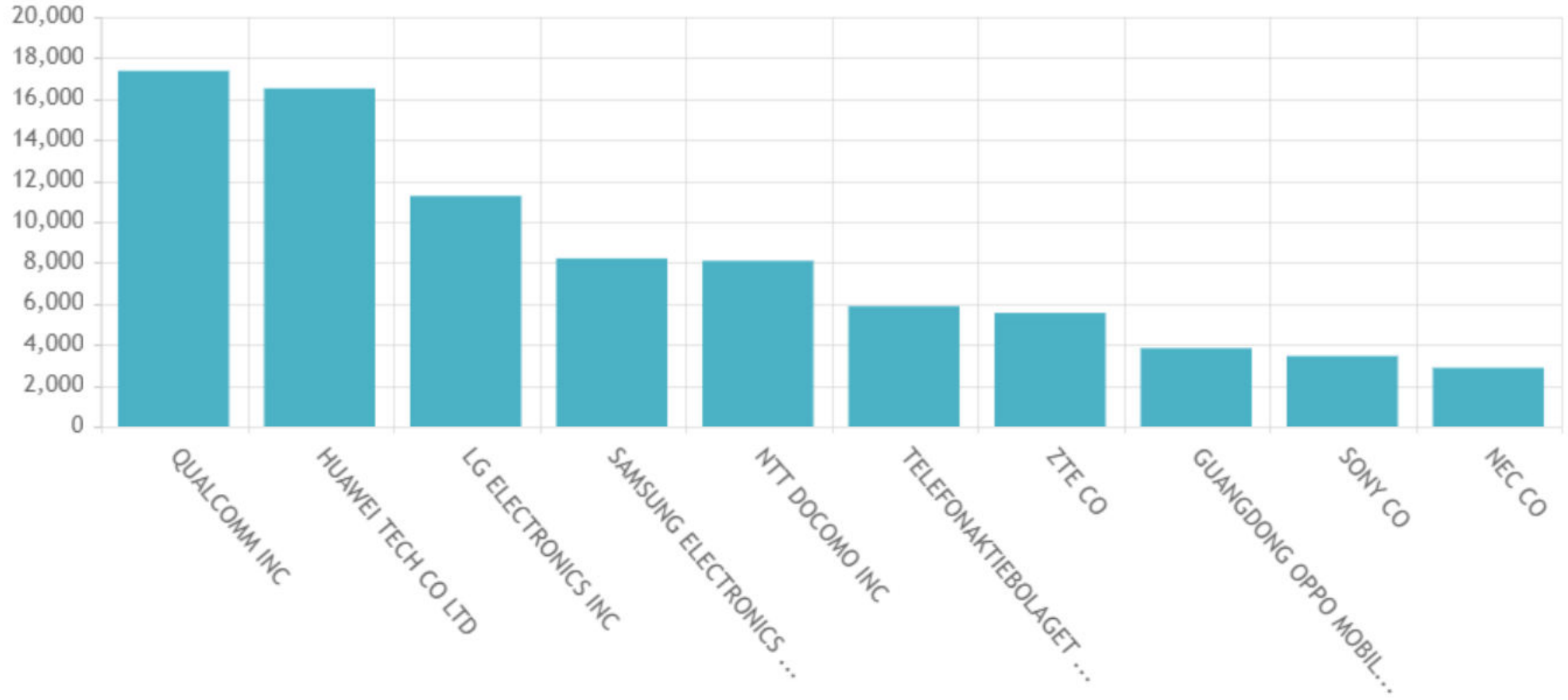
India Vs rest in top ten institutes in last 20 years considering KTs



CAMBRIDGE INSTITUTE OF TECHNOLOGY

India Vs rest in top ten institutes in last 20 years considering IPCs



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Top Indian institutes based on scholarly works

1	QUALCOMM INCORPORATED, USA
2	EITAN, Alecsander, USA
3	TELEFONAKTIEBOLAGET L M ERICSSON(PUBL), Sweden
4	SKYLARK WIRELESS, LLC, USA
5	ALCATEL LUCENT, France
6	ZTE CORPORATION, China
7	DREXEL UNIVERSITY, USA
8	NTT DOCOMO, INC, japan
9	LG ELECTRONICS INC, Korea
10	MARVELL WORLD TRADE LTD, Barbados
11	SIEMENS HOME AND OFFICE COMMUNICATION DEVICES GmbH & CO.KG, Germany

Conclusion on patentability

- Based on the searches performed, it has been concluded on the possibility of a patent filing on the topic

  "Sparsity-based channel estimation Technique"

- a. Highly recommended
- The recommendation is based on our understanding

1. Literature survey carried out during PhD work
2. Only 11 institutes have contributed through 20 patent filing

Contact

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  sp.ece@cambridge.edu.in

CAMBRIDGE
INSTITUTE OF TECHNOLOGY

Patent landscape report on Intelligent Reflecting Surfaces(IRS)

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CAMBRIDGE INSTITUTE OF TECHNOLOGY

Domain/topic

- Name of the domain/topic: **Intelligent Reflecting Systems**
- IPC: **H04W 72/04**
- IPC: Query used as such: **IRS AND mmWave AND massive MIMO**

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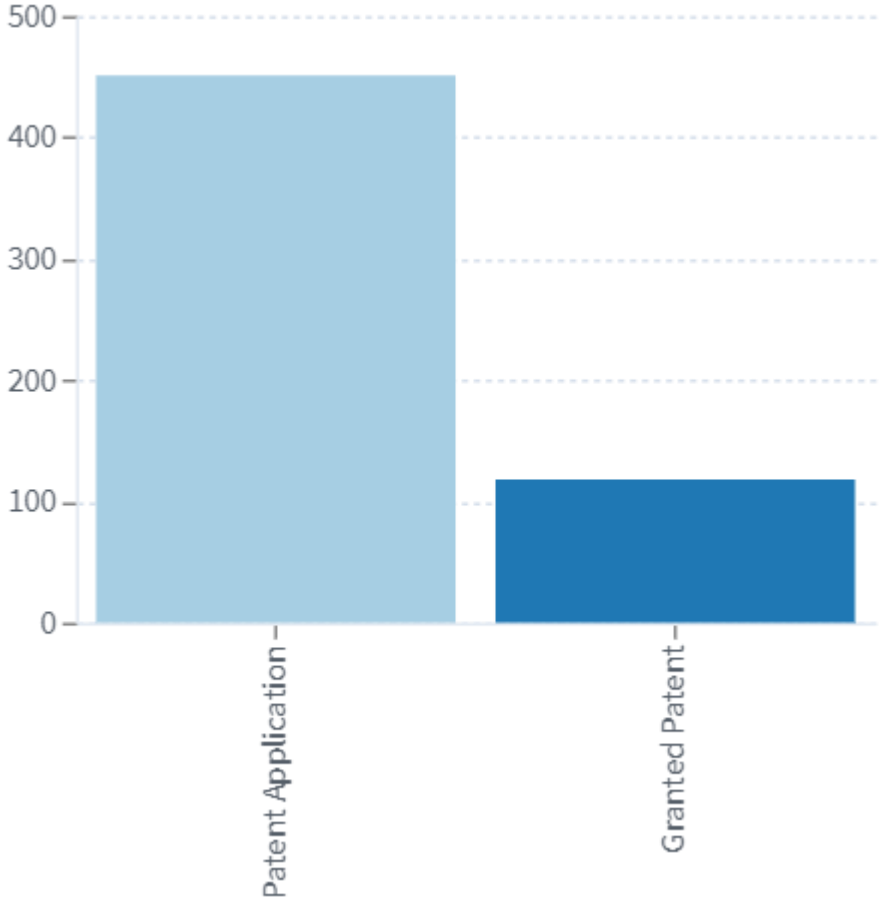
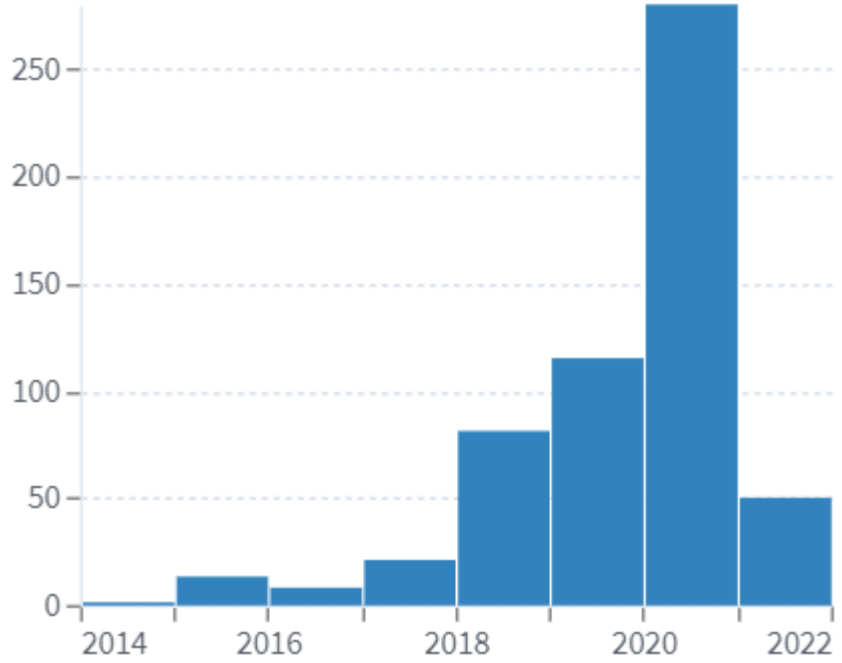
India Vs rest in patent filing in last 20 years





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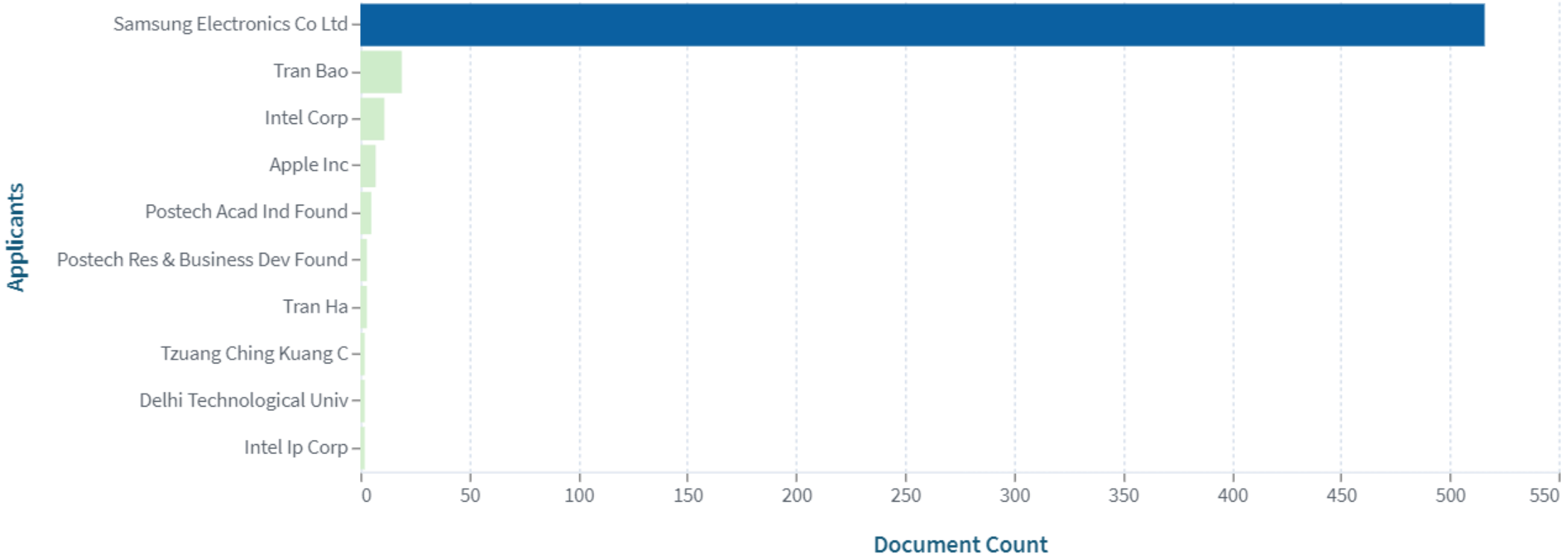
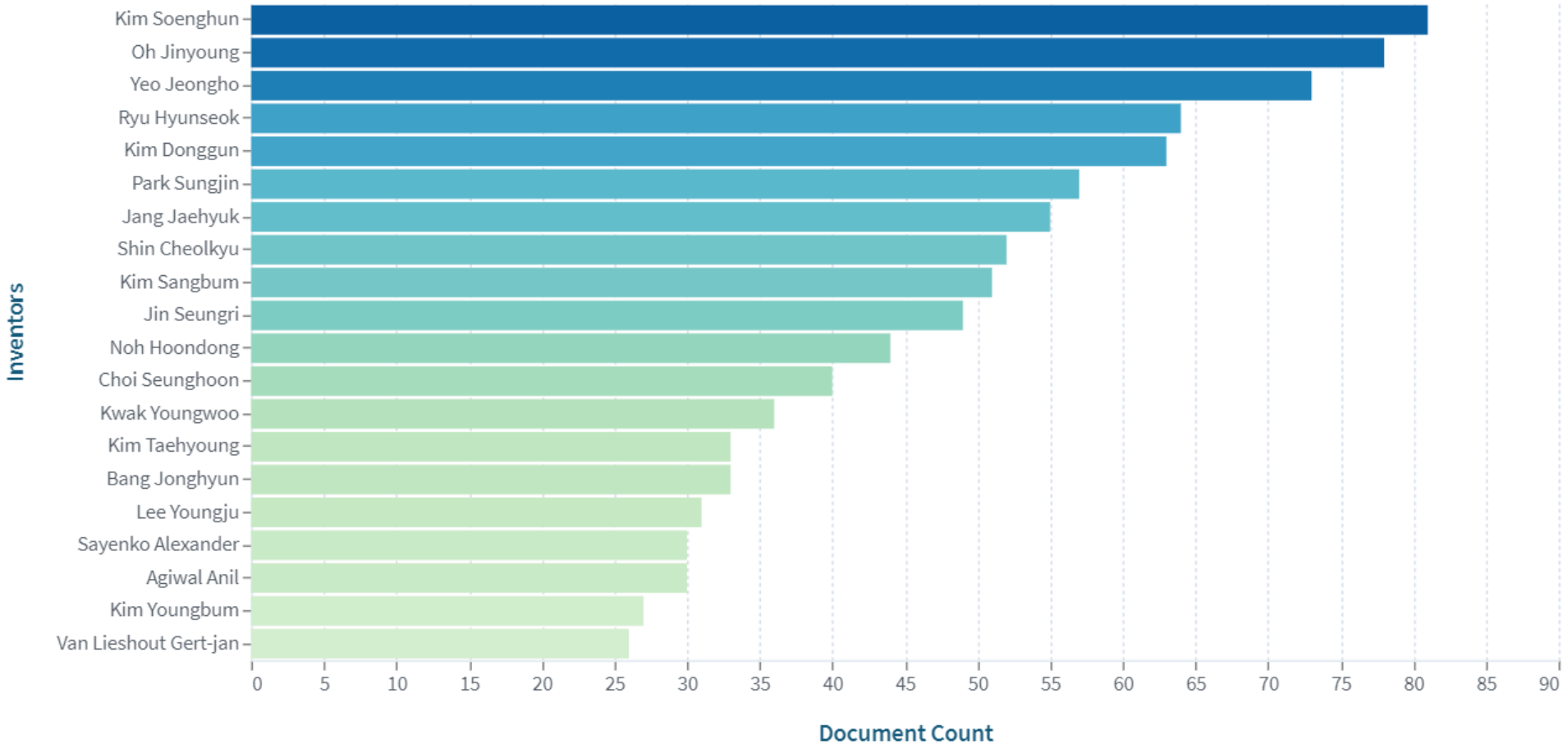
India Vs rest in top ten applicants in last 20 years



CAMBRIDGE INSTITUTE OF TECHNOLOGY

India Vs rest in top ten inventors in last 20 years



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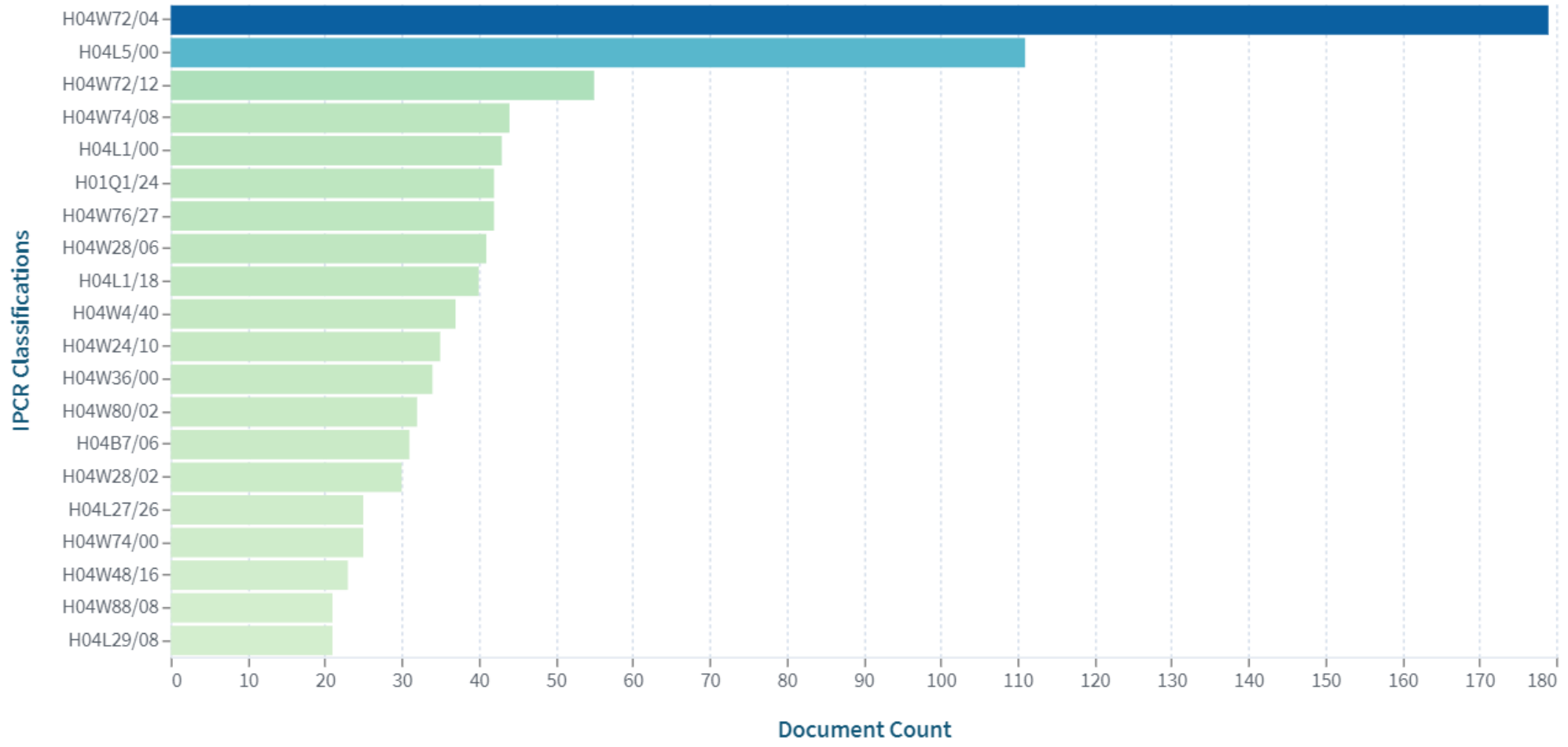
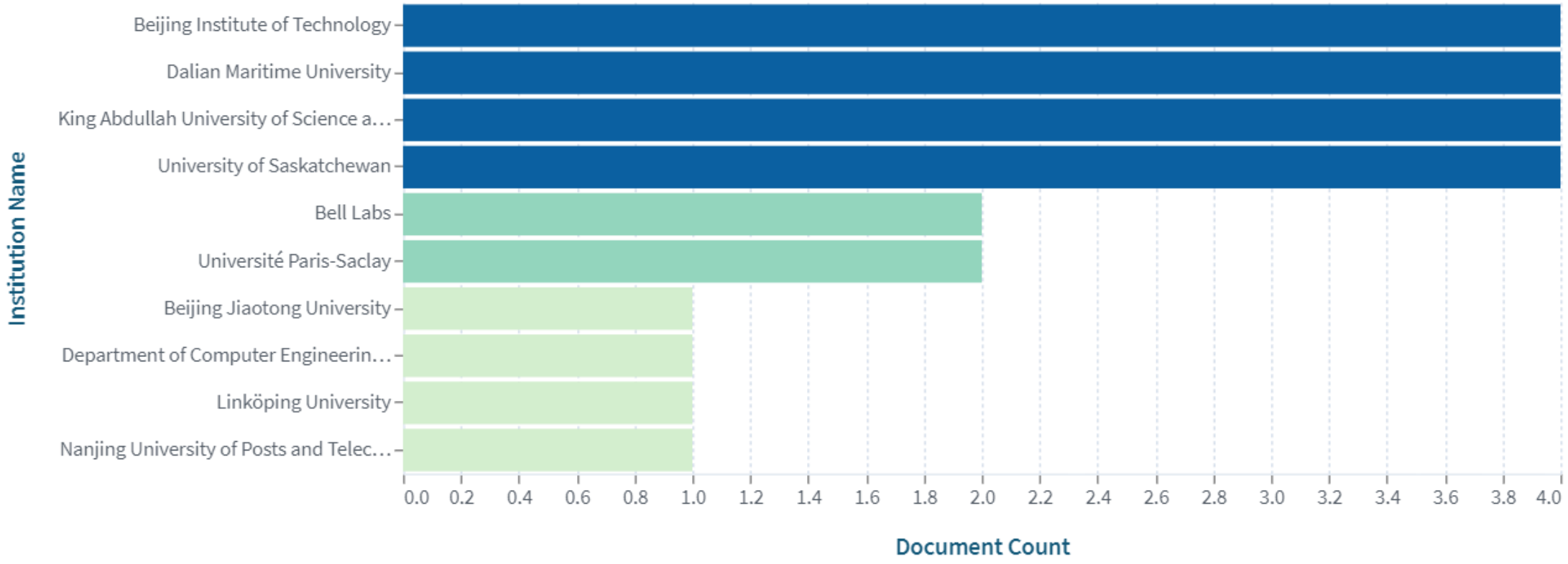
India Vs rest in top ten IPCs in last 20 years



CAMBRIDGE INSTITUTE OF TECHNOLOGY

India Vs rest in top ten institutes in last 20 years



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3 Key technologies and IPCs used

- KT1: Intelligent reflecting surfaces
- KT2: Milli metre wave Technology
- KT3: Massive MIMO

- IPC1: H04W 72/04
- IPC2: H04L 5/00
- IPC2: H04W 72/12

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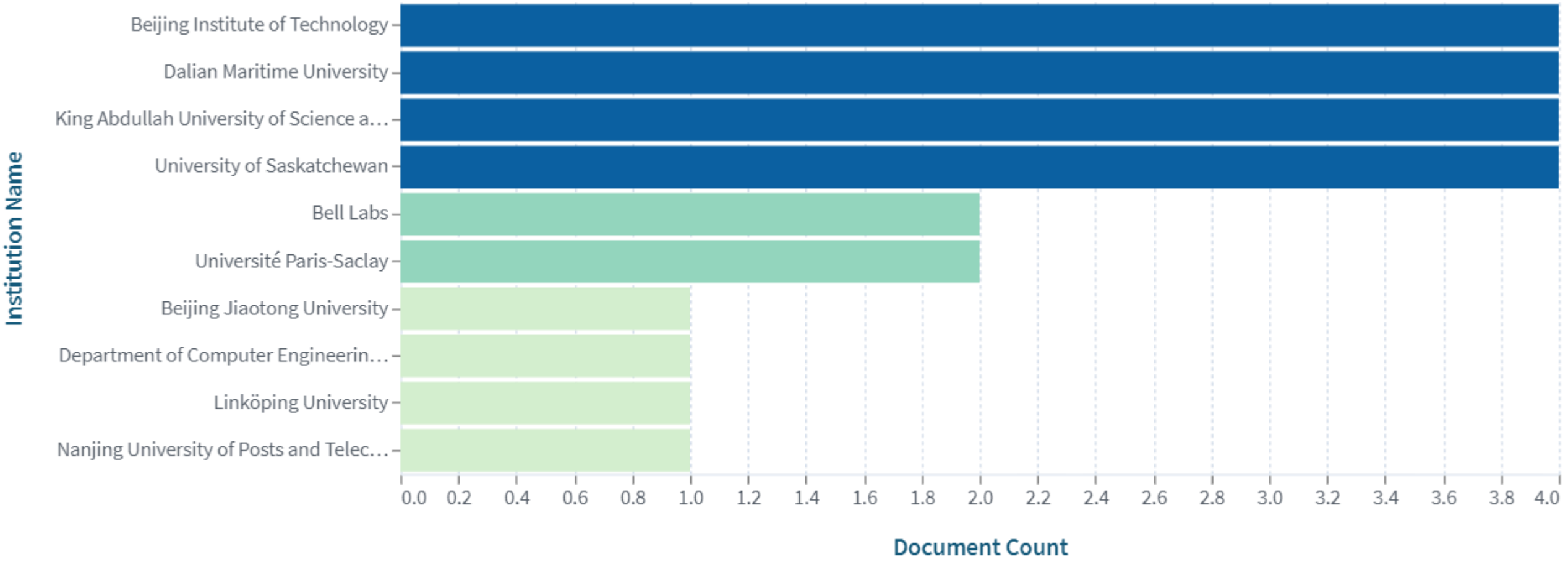
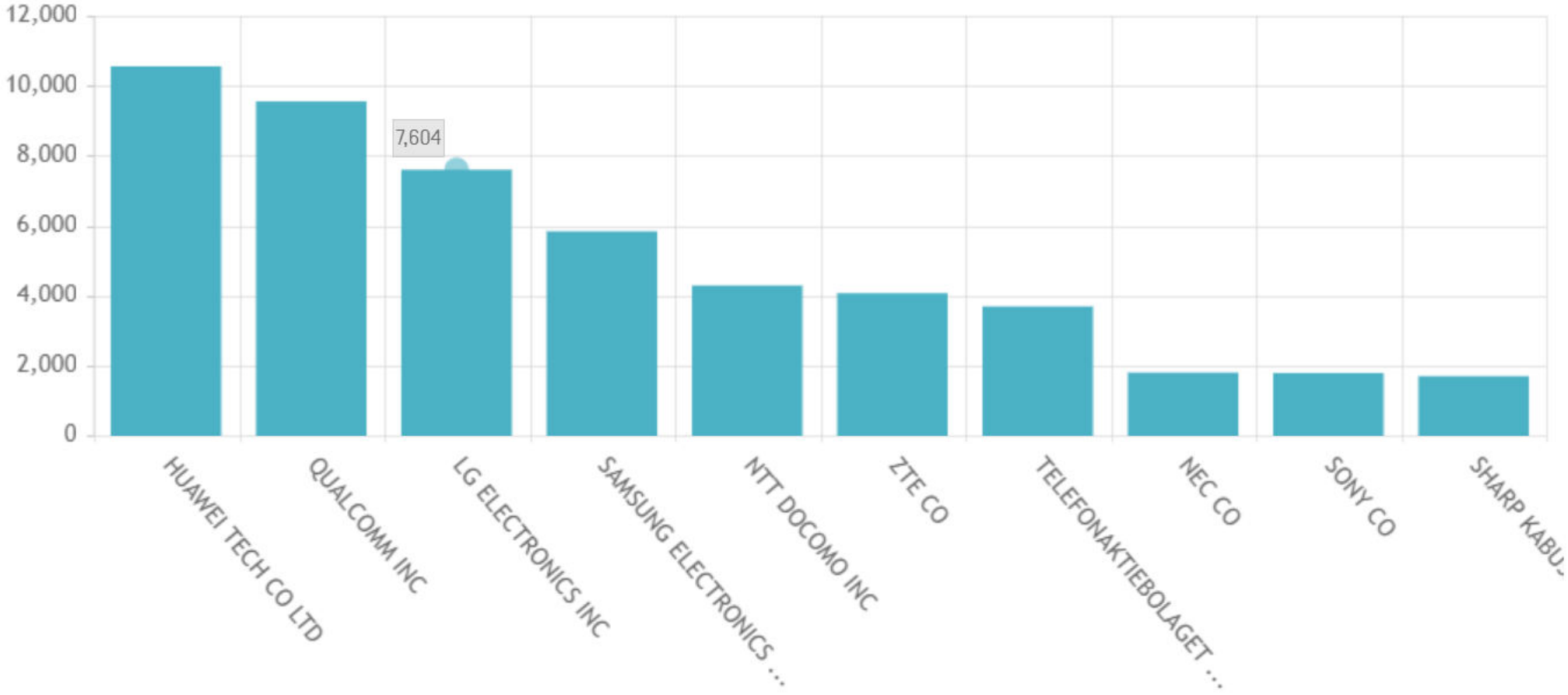
India Vs rest in top ten institutes in last 20 years considering KTs



CAMBRIDGE INSTITUTE OF TECHNOLOGY

India Vs rest in top ten institutes in last 20 years considering IPCs



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Top Indian institutes based on scholarly works

- Zero patent applications

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Conclusion on patentability

- Based on the searches performed, it has been concluded on the possibility of a patent filing on the topic

  "IRS for mmWave MIMO Technology."

- a. Highly recommended
- The recommendation is based on our understanding

1. IRS is the technology proposed for 6G communication by IEEE
2. Absolutely new technology

Contact

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  Cambridge Institute of Technology
- K.R. Puram,
  560036 Bengaluru, India
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- E-mail:
  sp.ece@cambridge.edu.in

CAMBRIDGE
INSTITUTE OF TECHNOLOGY

Patent landscape report on Novel methods for buried object detection using Ground penetrating Radar (GPR)

Prof. Shivapanchakshari T G,
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sp.ece@Cambridge.edu.in

CAMBRIDGE INSTITUTE OF TECHNOLOGY

Domain/topic

- Name of the domain/topic: **Buried Object detection using Ground penetrating Radar**

- IPC: **G01S 13/88**
- Query used as such: **Ground penetrating Radar AND Buried object detection AND SFCW**

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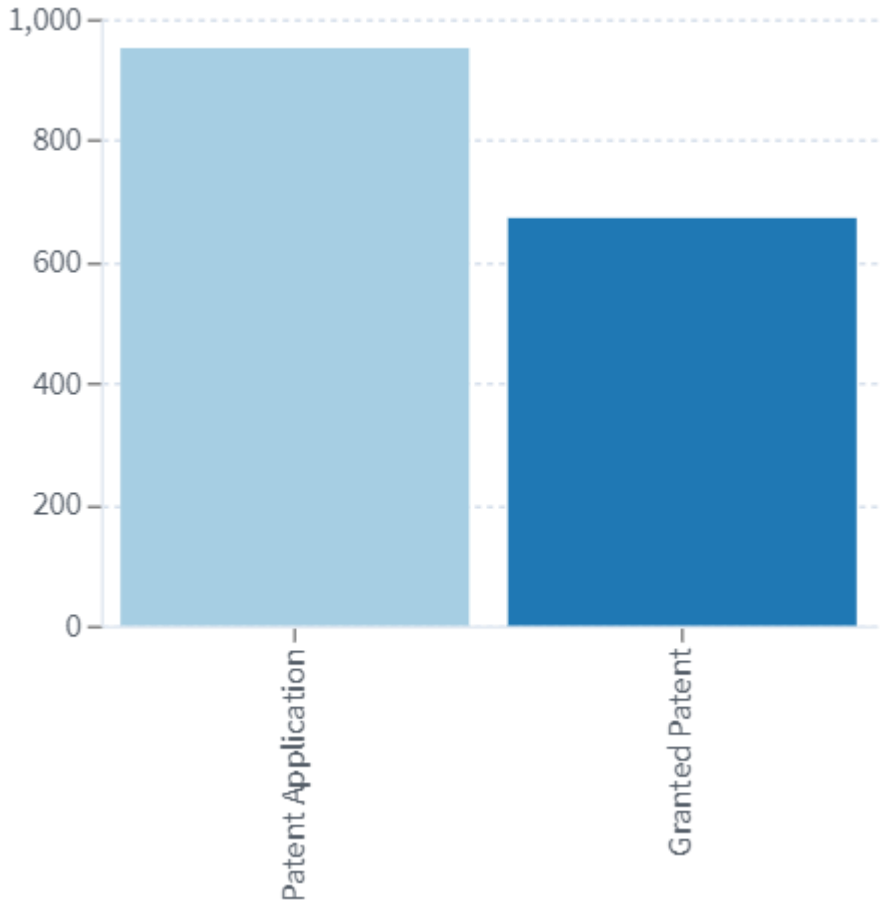
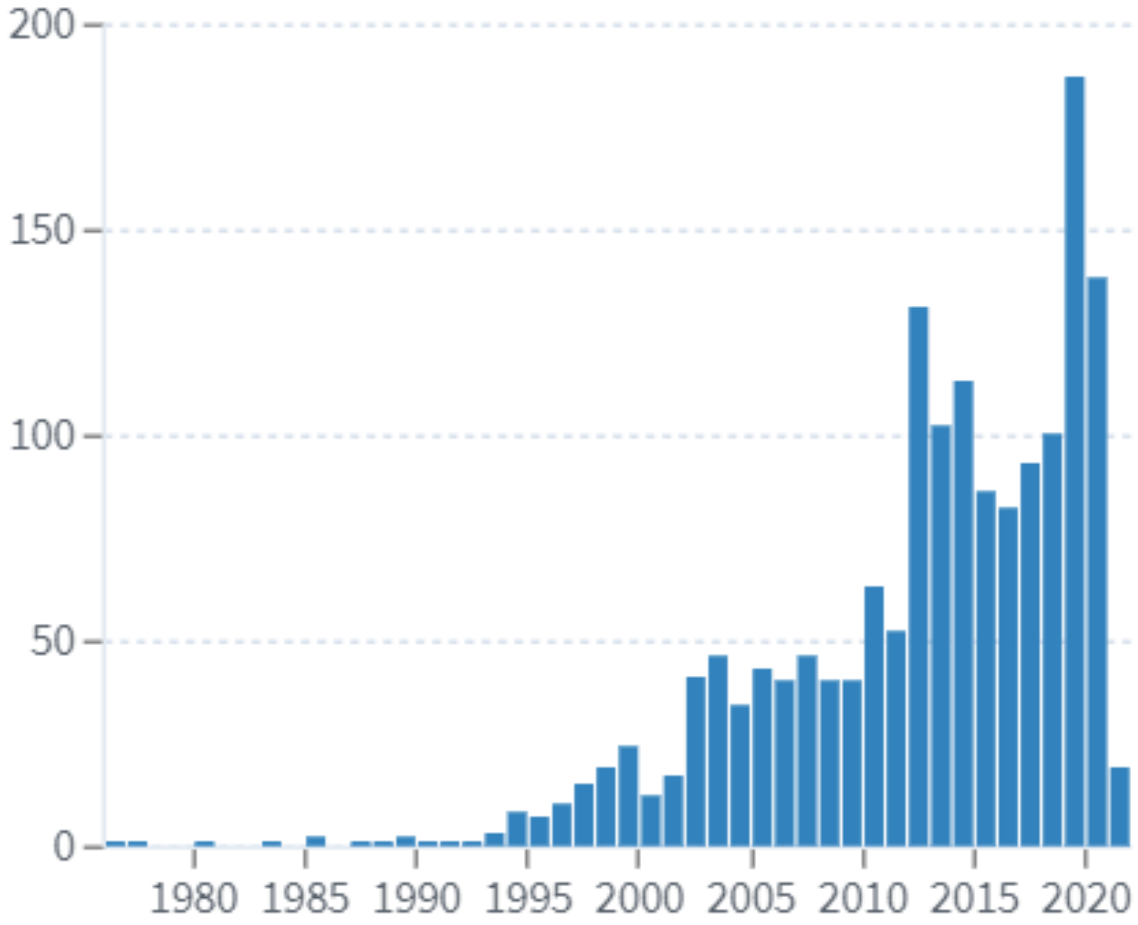
India Vs rest in patent filing in last 20 years





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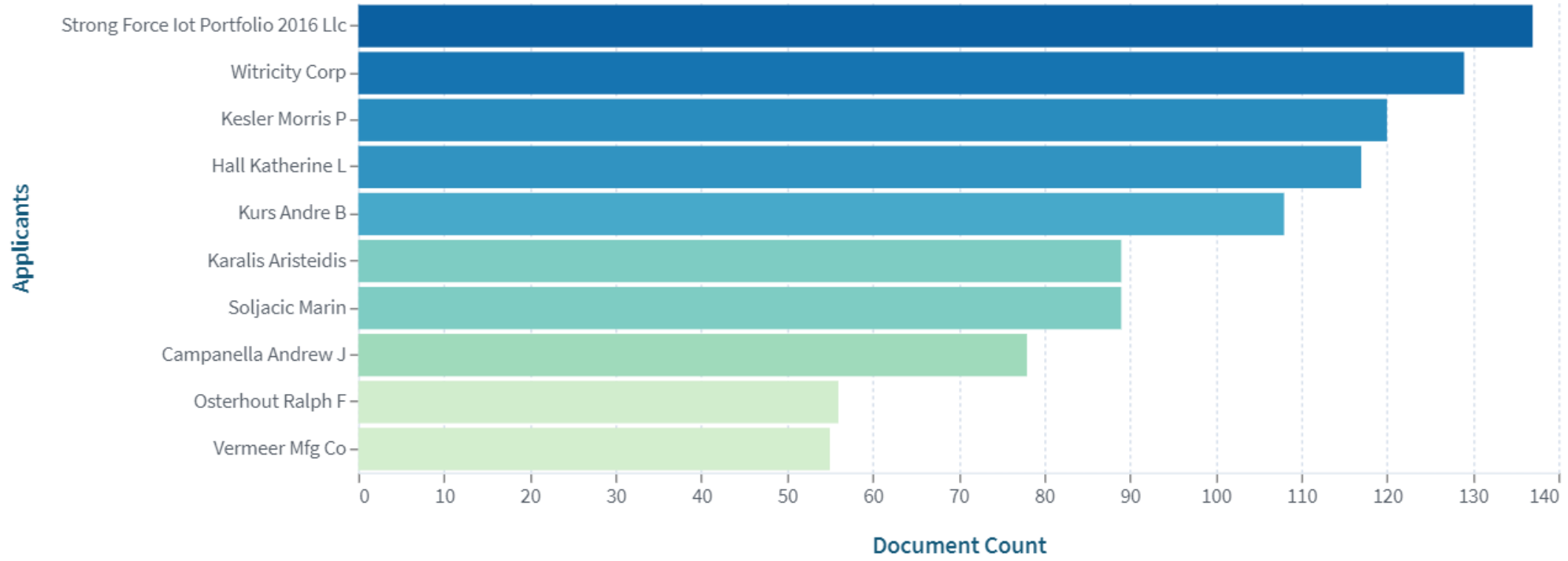
India Vs rest in top ten applicants in last 20 years



CAMBRIDGE INSTITUTE OF TECHNOLOGY

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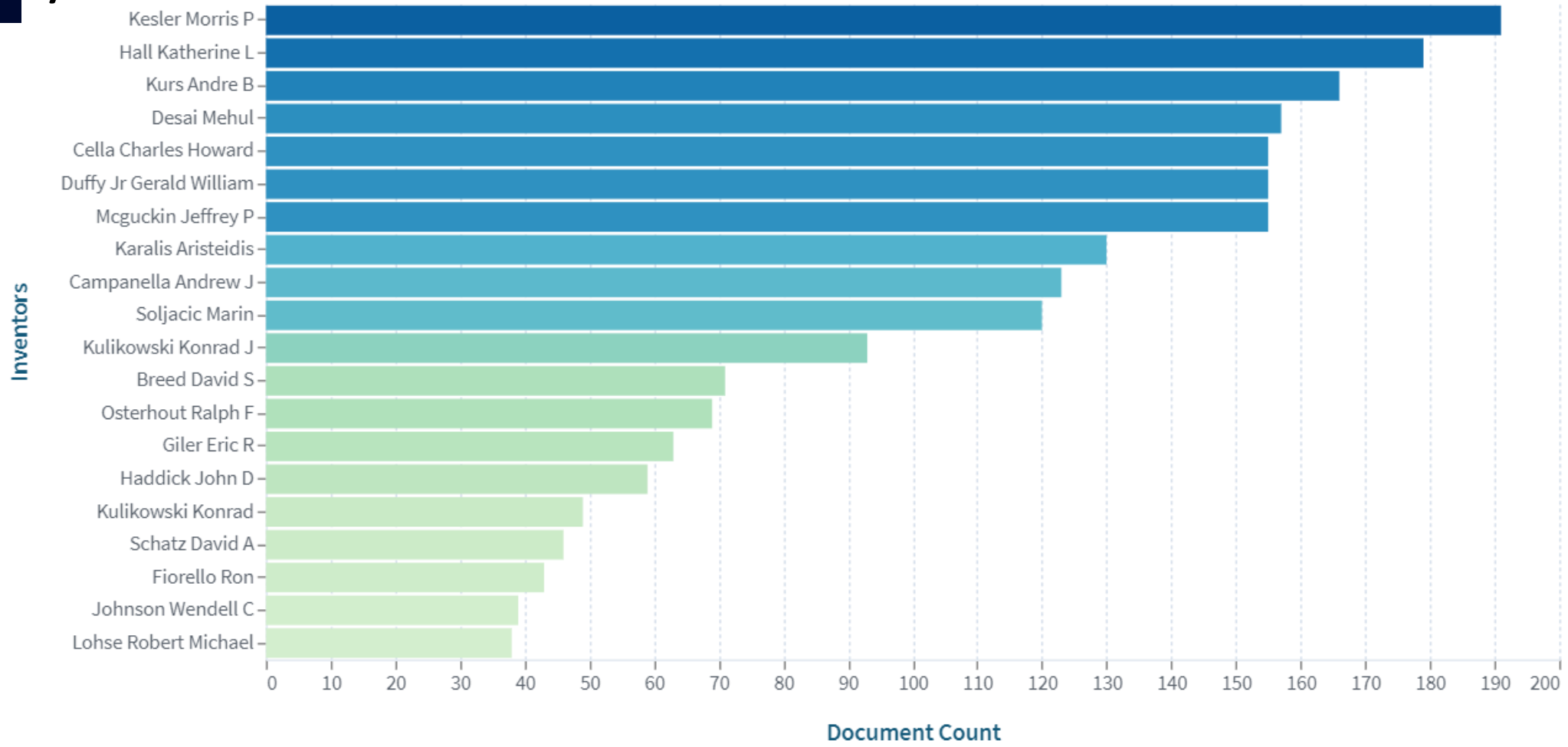
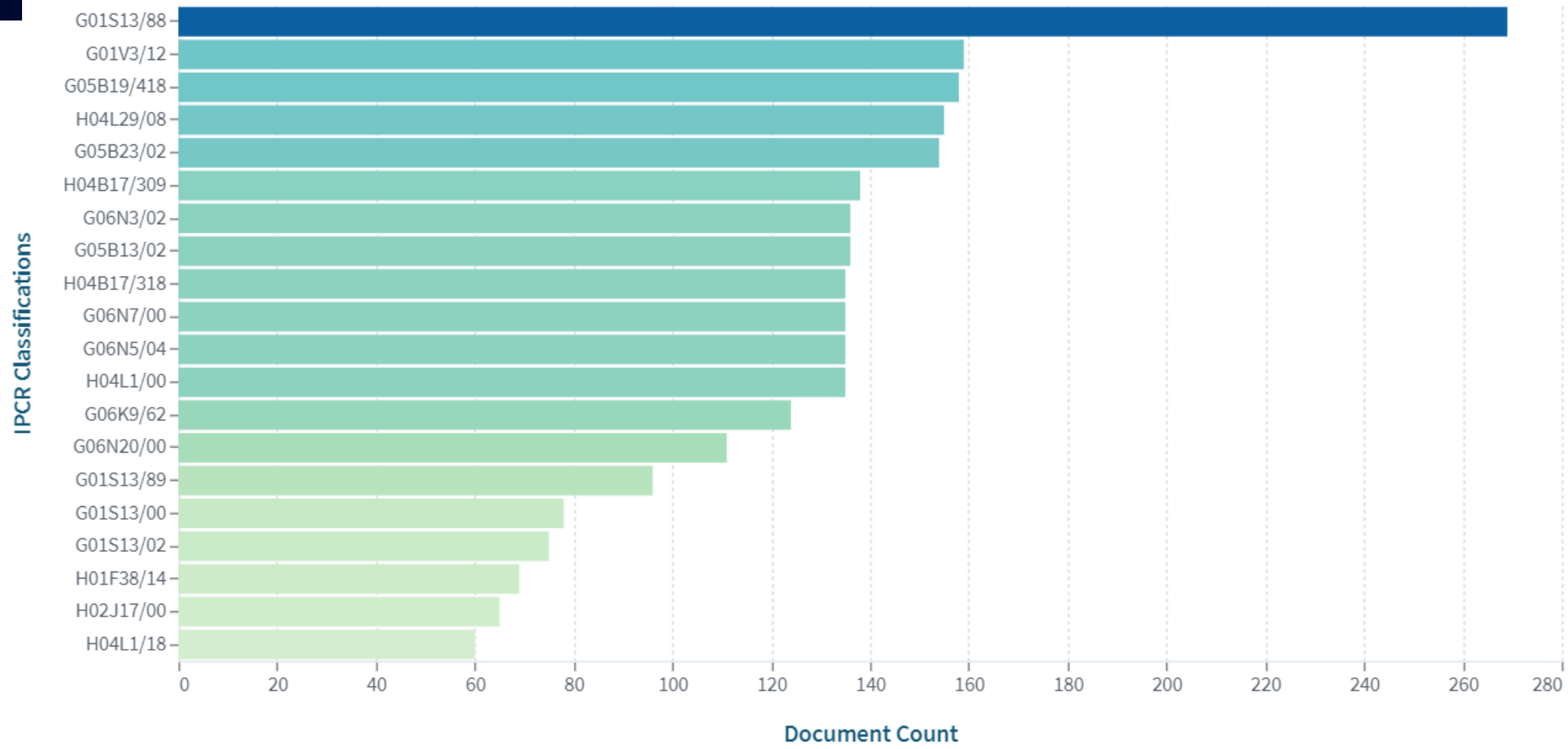


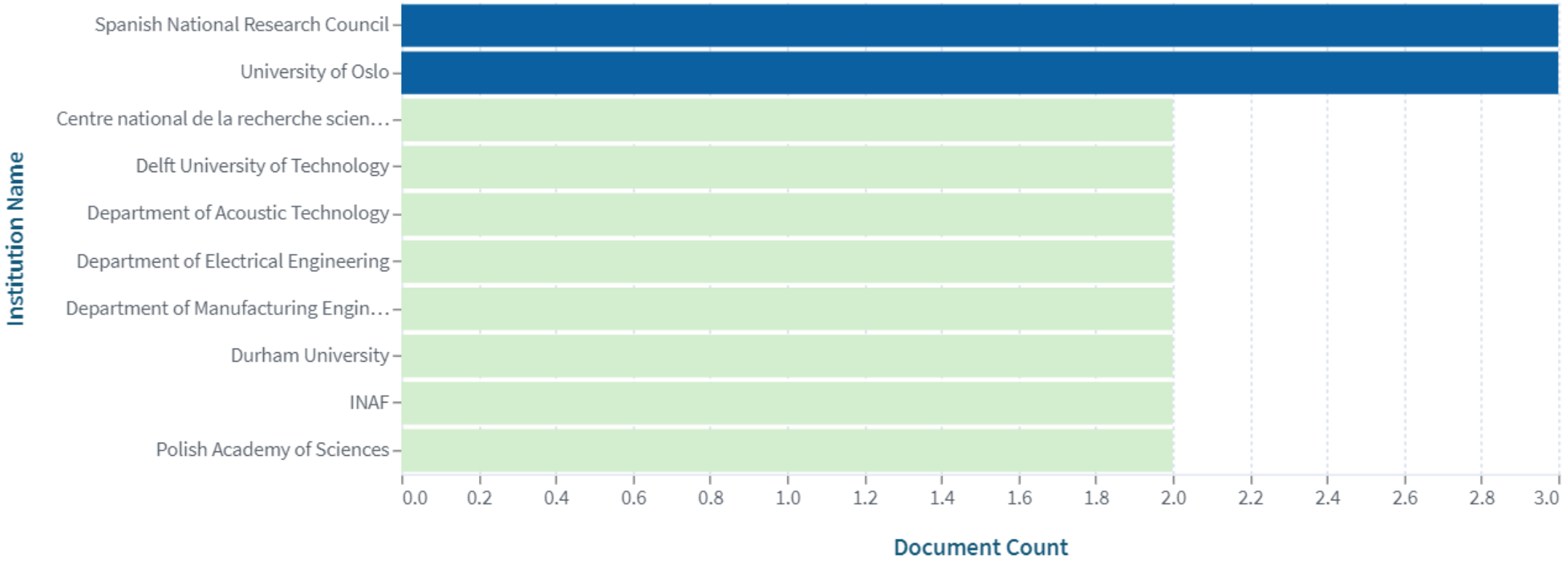
CAMBRIDGE INSTITUTE OF TECHNOLOGY

India Vs rest in top ten IPCs in last 20 years



CAMBRIDGE INSTITUTE OF TECHNOLOGY

India Vs rest in top ten institutes in last 20 years



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3 Key technologies and IPCs used

- KT1: Ground penetrating Radar
- KT2: Object detection using radio waves
- KT3: Stepped frequency continuous wave radar Technology

- IPC1: G01S 13/88
- IPC2:IPC3:G01V 3/12
- IPC2: G05B19/418

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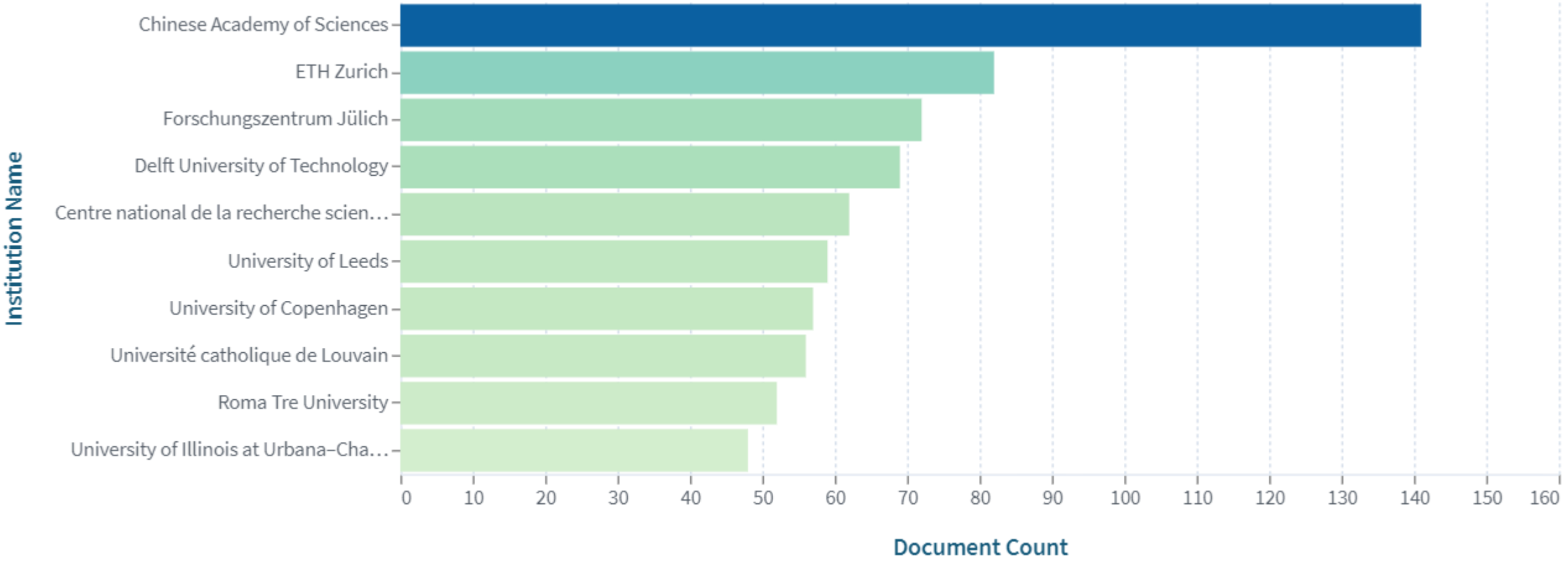
India Vs rest in top ten institutes in last 20 years considering KTs



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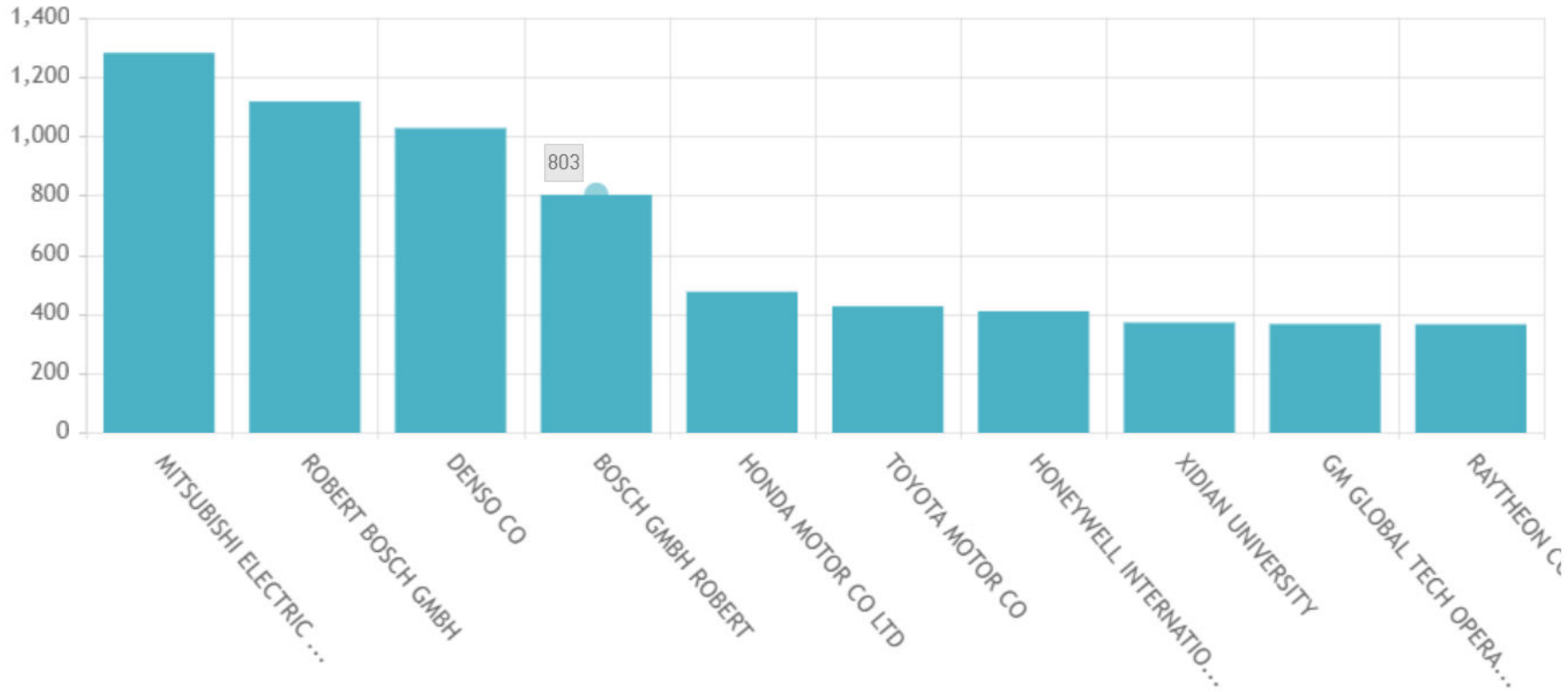
India Vs rest in top ten institutes in last 20 years considering IPCs



Top Indian institutes based on scholarly works

1	UNDERGROUND IMAGING TECHNOLOGIES, USA
2	Faculty from Engg colleges, Tamilnadu
3	VELTECH DR. RR & DR. SR TECHNICAL UNIVERSITY, Chennai, India

Application Number	Title	Application Date	Status	
202141009067	DETECTION OF DEPTH OF THE TUMOR USING *GROUND PENETRATING RADAR* ALGORITHM & MICROWAVE IMAGING	04/03/2021	Published	Application Status
4449/CHE/2015	SEGMENTED PATCH ANTENNA *RADAR* FOR *GROUND PENETRATING RADAR* APPLICATIONS	25/08/2015	Published	Application Status
3294/DELNP/2010	POSITIONING CORRECTION SYSTEM AND METHOD FOR SINGLE AND MULTI-CHANNEL *GROUND PENETRATING RADAR*	10/05/2010	Published	Application Status

Total Document(s): 3 Page: First << 1 >> Last

Conclusion on patentability

- Based on the searches performed, it has been concluded on the possibility of a patent filing on the topic
- "**Novel methods for Buried Object detection using Ground penetrating Radar** "

a. Highly Recommended

- The recommendation is based on our understanding

1. This topic is based on project proposal submitted to LRDE
2. Useful future interaction with DRDO/LRDE

Contact

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