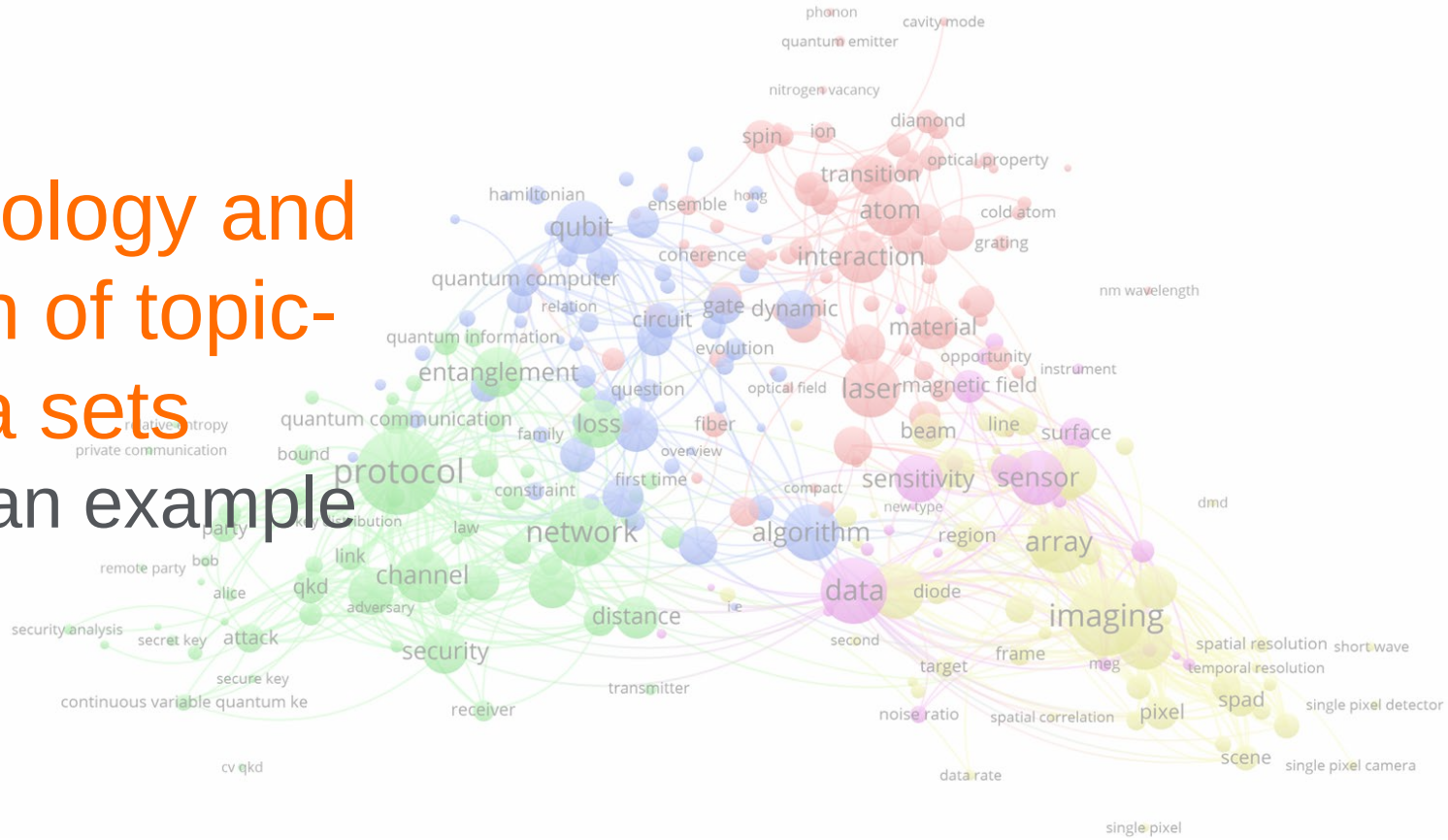
Science-Metrix' methodology and tool to ease the creation of topic-specific publication data sets

Quantum technologies as an example



BRIC 2023, Ottawa, June 7

Presenter: David Campbell, Alexandre Bédard-Vallée, Paul Khayat and Danielle Dong

Presentation outline

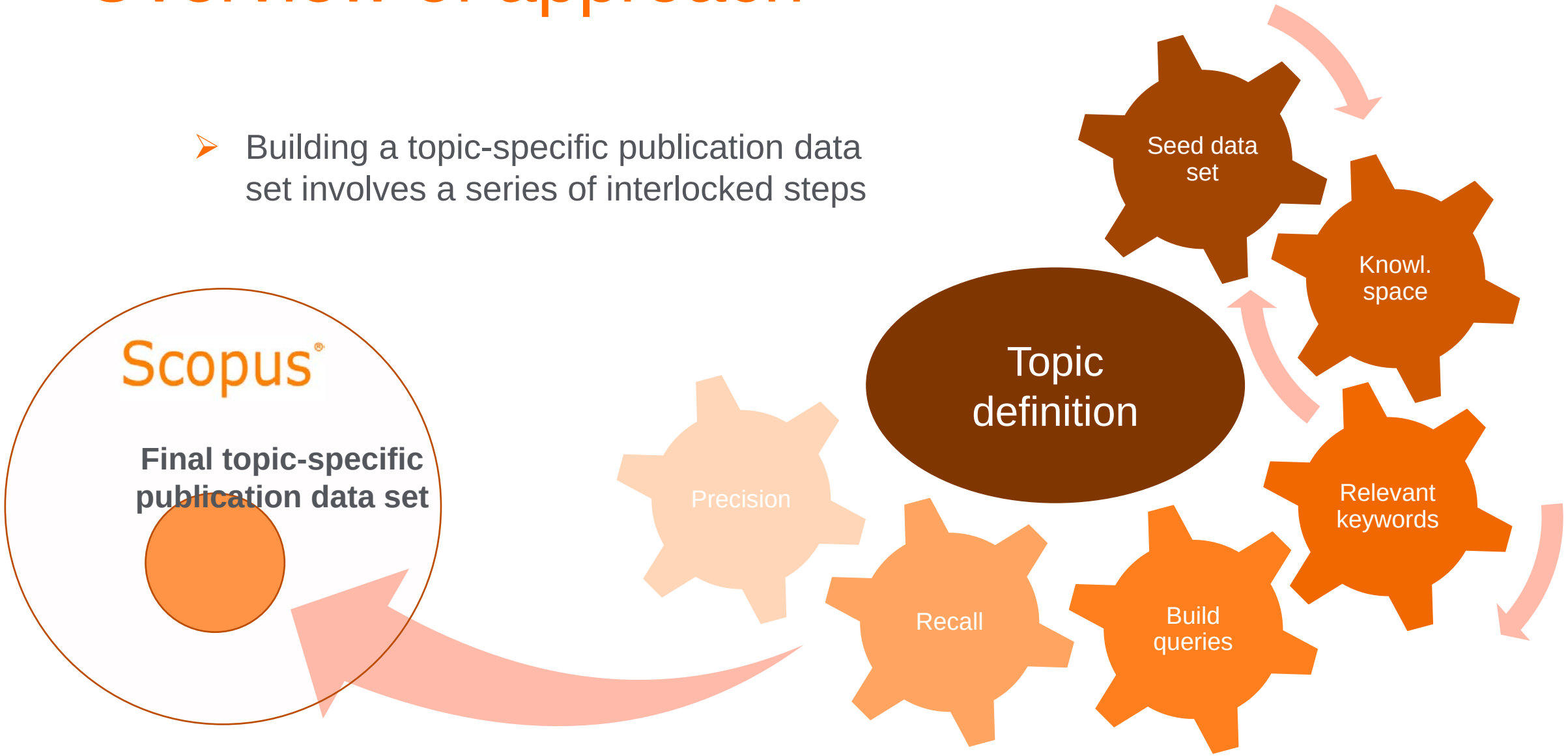
- Defining the problem (use cases)
- Overview of approach to the construction of topic-specific publication data sets
- Overview of Minerva – a tool to facilitate the construction of thematic data sets
- Conclusion

Defining the problem

- Librarians/bibliometricians, researchers, task forces and decision makers often need to retrieve sets of sci. publications pertaining to specific topics (thematics/areas)
  - Literature review in support of:
    - an original research project
    - a meta-analysis/synthesis project
    - a guideline
  - Collect a census/sample of relevant publications for:
    - Benchmarking purposes in a specific “priority” area
    - Monitoring progress in a specific “priority” area
    - Informing R&I strategy(ies)
    - Evaluating the impact of a specific funding program
- **Fictive problem:** Retrieve publications pertaining to quantum technologies to assess country performances in this area

Overview of approach

- Building a topic-specific publication data set involves a series of interlocked steps



Overview of approach – Topic definition

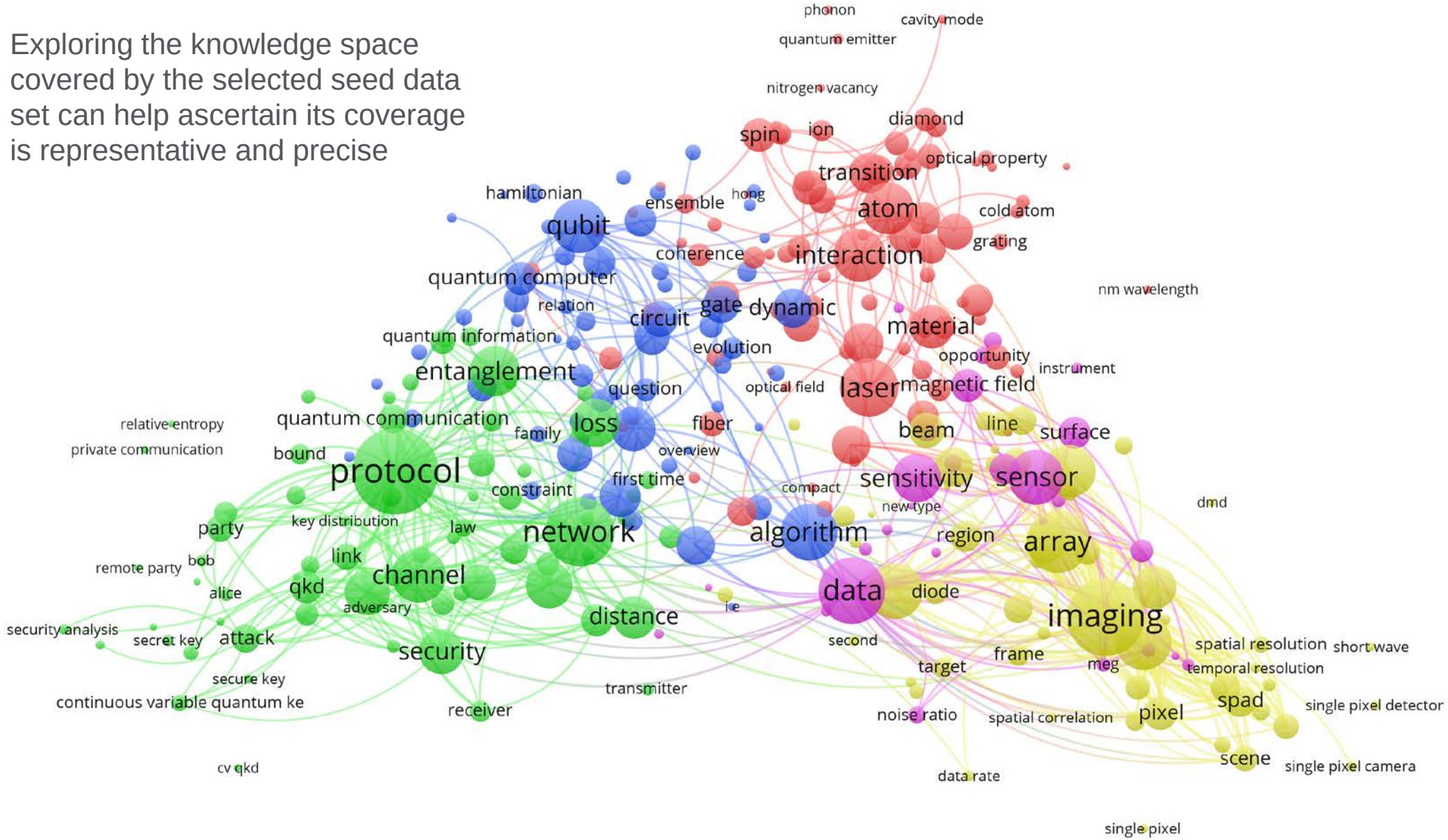
- A topic should be defined in collaboration with relevant stakeholders
- Possible definition source(s):
  - Desk research (strategic plan, work programme, funding call, etc.)
  - Programme managers
  - Subject matter experts (various stakeholder types)
  - Any combination of the above and more
- Definition of quantum technologies with broad ranging application in healthcare, energy, environment, etc. (**Sources:** Desk research and client):
  - **Quantum computing/information/simulation:** applications, algorithms, architectures, quantum-classical interface, quantum hardware
  - **Quantum communication:** quantum security/networks, quantum key distribution (QKD), quantum internet, chip-based technologies, quantum-safe communications, post-quantum cryptography
  - **Quantum sensing/timing:** quantum sensors for a wide range of applications as well as quantum clocks for global navigation satellite systems and more...
  - **Quantum imaging:** ultra-high sensitive cameras such as single photon cameras, single pixel cameras, extreme time resolution imaging, 3D profiling, hyper-spectral, ultra-low flux covert illumination, imaging beyond line-of-sight, and imaging of local gravity fields.
  - **Quantum materials:** superconductors, graphene, quantum spin liquids, and spin ices

Overview of approach – Seed data set

- Several non-mutually exclusive options are usually available for operationalizing a topic definition in bibliometric terms to obtain a seed data set
  - Specialized journals
  - Specialized research centres/groups
  - Publications funded by a funding programme dedicated to the relevant area
  - Literature cited by review articles focused on the relevant area
- Regardless of what makes up a seed data set, it should be:
  - **Representative** of the whole area of interest (covering all relevant sub-topics)
  - **Precise** (does not cover irrelevant publications)
  - Seed data sets are rarely perfect and our iterative approach and tool helps uncover/resolve both issues
- For quantum technologies, the seed consisted of:
  - Publications funded by UK's National Quantum Technology Program (NQTP) (1,479 papers)
  - Other options could have included specialized journals (e.g., *IEEE Journal of Quantum Electronics*, *Quantum Electronics, Quantum Information Processing, Quantum Information and Computation, Advanced Quantum Technologies, Quantum Machine Intelligence, Materials for Quantum Technology*) as well as publications cited by quantum technology reviews (4,766)

Overview of approach – Knowl. space

- Exploring the knowledge space covered by the selected seed data set can help ascertain its coverage is representative and precise



Overview of approach – Relevant keywords

- One must then uncover highly specific keywords/search expressions to precisely retrieve relevant publications from the selected seed and beyond (to recover relevant publications from other portions of the selected database (here Scopus)). Potential sources from which to extract keywords include:
  - Keywords extracted from the seed (in desc order of relevance)
  - Desk research
  - Controlled vocabulary (specialized DBs such as Medline (MeSH) and Embase (Emtree))

- **Relevance of keywords from the seed:**
  - NLP extraction
  - Ranking by TF-IDF

$$TF\text{-}IDF = \left(1 + \log\left(df^{t}_{corpus}\right)\right) * log\left(N_{Scopus}/df^{t}_{Scopus}\right)$$

  - **All terms must be checked:** single terms, expressions that may not be that specific, and those that may relate to fundamental physics more than to technology (highlighted in red)

Keyword	Occurrence in seed	Occurrence in Scopus	TF-IDF
Quantum Key Distribution	120	4,277	8.91
Single Photon Avalanche Diode	62	1,306	8.65
Quantum Communication	98	5,657	8.36
Quantum Cryptography	71	4,856	7.95
Particle Beam	132	14,513	7.82
Quantum Computer	116	13,022	7.72
Quantum Optics	166	23,815	7.66
Quantum Computing	108	10,640	7.66
Avalanche Diodes	39	1,437	7.58
Quantum Network	50	2,177	7.50
Quantum	525	127,503	7.49
Quantum Channel	38	2,926	7.40
Key Rate	60	1,779	7.38
Photon	327	128,293	7.20
Single Photon Detector	42	2,016	7.01
Quantum Information	72	7,781	6.92
Quantum State	87	11,808	6.83
Quantum Theory	140	59,262	6.59
Laser Cooling	26	1,761	6.55
Metrology	74	22,249	6.49
Quantum Device	33	2,925	6.44
Quantum Mechanics	63	15,517	6.39
Quantum Dot	169	77,187	6.32
Single Photon Source	21	1,802	5.96
Quantum Simulation	24	2,412	5.96
Quantum Circuit	33	3,248	5.83
Quantum Information Processing	31	4,345	5.80

Overview of approach – Building queries

- Relevant keywords are then tested prior being committed to the collection of search queries. Each keyword is iteratively tested to:
  - Confirm **relevance** and assess **precision**
  - How to refine search strategies?
    - Combine several keywords with or without use of advanced features such as proximity searches
      - TITLE-ABS-KEY("quantum" OR "sensor"): ⛔ To many false positives
      - TITLE-ABS-KEY("quantum" AND "sensor"): ⛔ To many false positives
      - TITLE-ABS-KEY({quantum sensor}): OK but restrained (470 results)
      - TITLE-ABS-KEY("quantum sensor"): Better but still restrained (1,150 results)
      - TITLE-ABS-KEY("quantum" Pre/2 “sensor"): Better but still restrained (1,799 results)

Article

Stabilization of PbS colloidal-quantum-dot gas sensors using atomic-ligand engineering

      - TITLE-ABS-KEY("quantum" W/2 “sensor"): Ideal (2,343 results)

Article

Room-Temperature NH_3 Sensor Based on SnO_2 Quantum Dots Functionalized SnS_2 Nanosheets

Overview of approach – Building queries

- Relevant keywords are then tested prior being committed to the overall search queries. Each keyword is iteratively tested to:
  - Confirm **relevance** and assess **precision**
  - How to refine search strategies?
    - Limiting scope of search using keywords or subject areas
      - TITLE-ABS-KEY("quantum" AND "material" AND NOT "dance")
      - (TITLE-ABS-KEY (("quantum" AND "material") AND NOT SUBJAREA (arts))

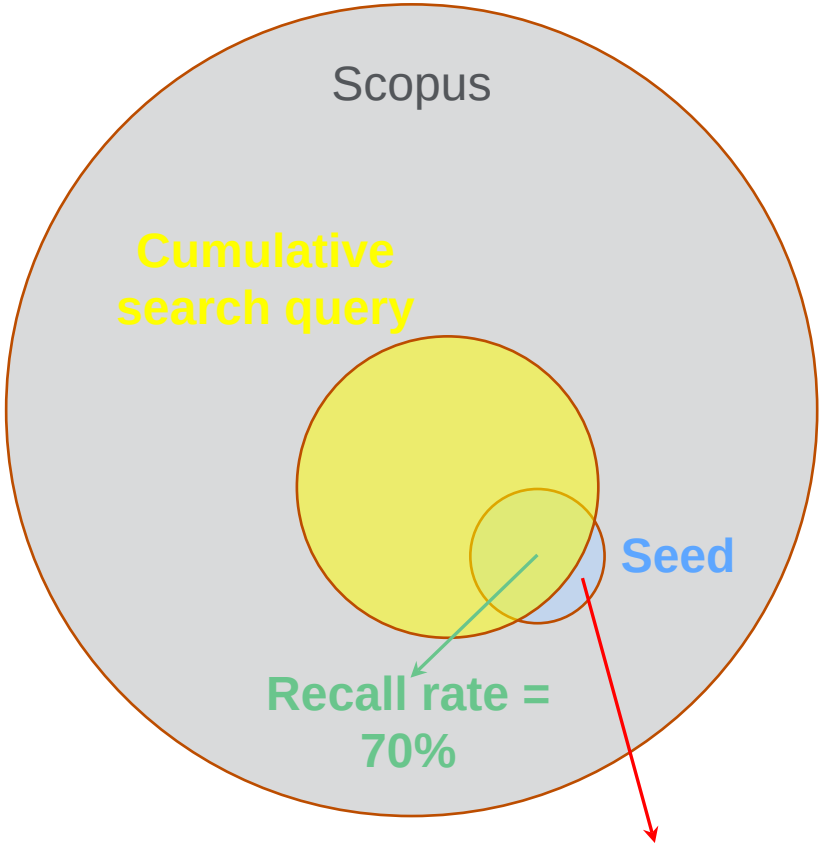
The Quantum Dance and the World's 'Extraordinary Liveliness': Refiguring Corporeal Ethics in Karen Barad's Agential Realism

In her 2007 monograph Meeting the Universe Halfway, Karen Barad introduces her reader to a world of movement and flux, where bodies ceaselessly participate in their own material configuration, where bodily integrity and identity is entangled in the dynamic materialisation of

    - Limiting the search to author keywords (i.e., excluding keyword enrichment (controlled vocabulary) which can sometimes incorrectly infer relevance of keywords to some documents)
      - ((TITLE-ABS("cesium beam") OR AUTHKEY("cesium beam")) **instead of** TITLE-ABS-KEY("cesium beam")

Overview of approach – Recall

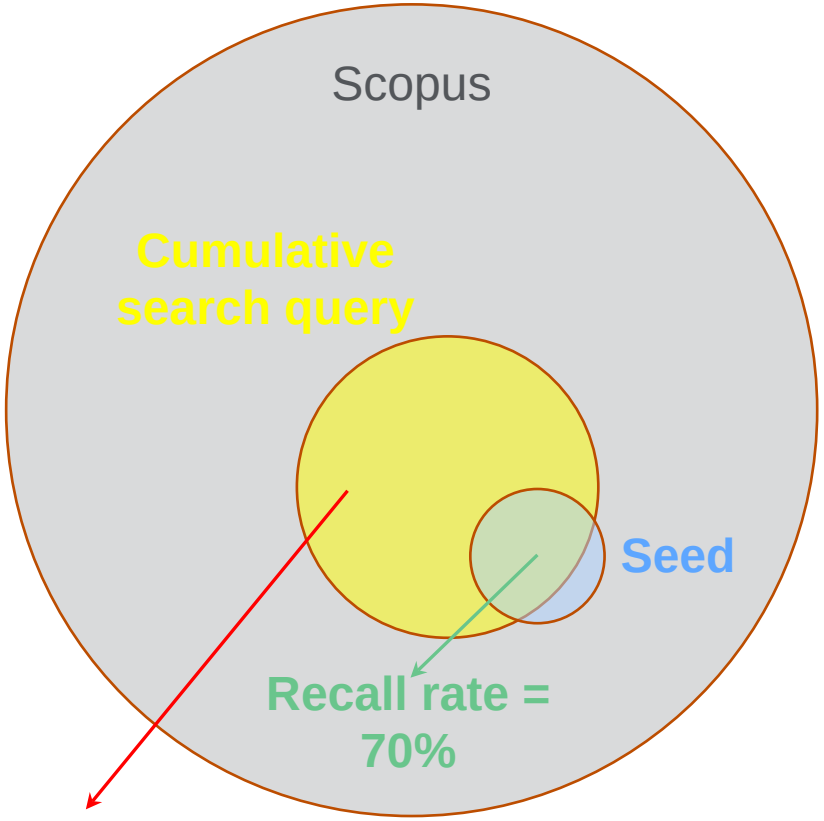
- As queries are committed to the overall search query, recall is estimated to:
  - Assess whether recall is satisfactory
  - Here we stopped at 70%
- Additional items (e.g., journals) against which to individually test recall can be added to:
  - Assess whether some relevant areas might have been overlooked
- Explore the unretrieved portion of the seed to:
  - Find patterns among relevant unretrieved outputs → new search queries
  - Compute precision of leftovers:
    - 30% of seed with 50% precision
    - Corrected recall = 70% / (70% + (30%*50%)) = 82%



Unretrieved portion may relate to noise in the seed: random sample to test precision

Overview of approach – Precision

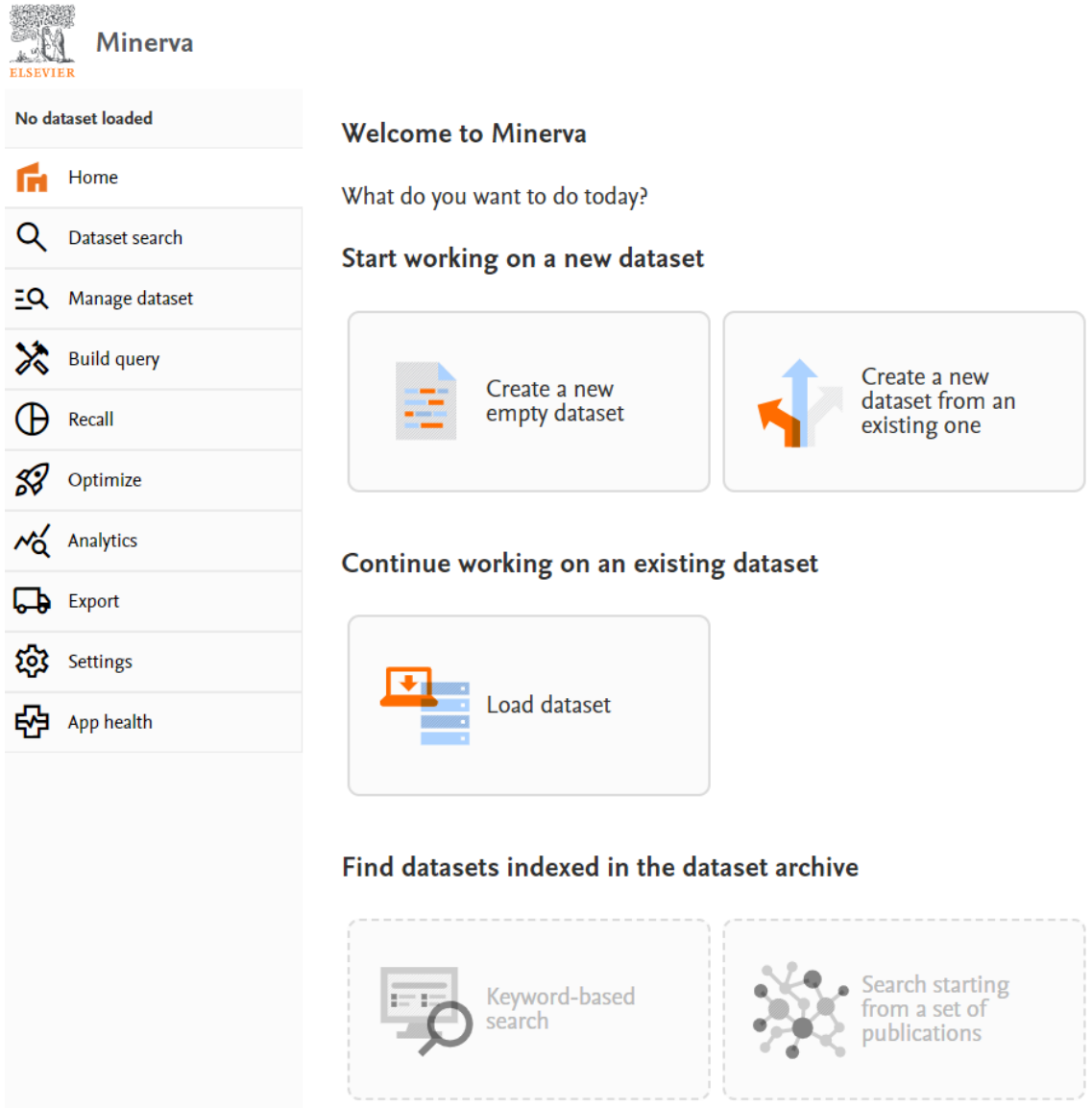
- Random sample of publication manually tagged as relevant or irrelevant by an analyst/expert to:
  - Assess whether precision is satisfactory
  - Here we stopped at 90%
- If precision is too low for the specific use case, the overall search query must be fine tuned by:
  - Checking individual queries (i.e. keywords) retrieving a large share of publications not captured elsewhere. Indicative of:
    - Irrelevant query needs to be restrained or removed
    - Relevant query may point an overlooked area
  - Improving individual queries looking for common patterns in the detected false positives
- Iteratively balancing recall and precision is a fine and challenging task!



Random sample of 100 papers retrieved by the overall query to assess precision

Overview of Minerva – a tool to facilitate the construction of thematic data sets

- Tool is under construction
  - For internal use in bibliometric studies
- Feedback welcome on whether such a tool could be of use in your work, and for which use case(s)



Overview of approach – Topic definition

Welcome to Minerva

What do you want to do today?

Start working on a new dataset

Create a new empty dataset

Create a new dataset from an existing one

Continue working on an existing dataset

Load dataset

Create a new dataset

X

Project code

This is the project name you are building this dataset for, in the same format as you input it in Jira.

2023_BRIC_Conference_QT

Dataset name

A descriptive but short name for the dataset you are building. Generally, the name of the thematic area it concerns.

Quantum Technology

Dataset description

A more detailed description of the dataset. What specific subjects are you aiming to capture, and which are you aiming to avoid? Try to be as exact as you can now, but you can always modify this description later.

```
Create a dataset of publications on Quantum Technologies
defined as (see: https://uknqt.ukri.org/our-programme/):

Seed data set: Publications funded by NQTP

Quantum computing/information/simulation: applications,
algorithms, architectures, quantum-classical interface, quantum
hardware

Quantum communication: quantum security/networks, quantum key
distribution (QKD), quantum internet, chip-based technologies,
quantum-safe communications, post-quantum cryptography
```

Year range

What years do you want to search documents in?

1996 2022

1996 2000 2004 2008 2012 2016 2020

Create dataset

Overview of approach – Knowl. Space/relevant keywords

Show 20 | sample: 993 | # of docs: 4887 | DOWNLOAD KEYWORD LIST | Search here :)

Show 1 to 20 of 4392 entries

First Previous 1 2 3 4 ... Next Last

Keyword	Term frequency	Document frequency	tfidf
filter	filter	filter	filter
QUANTUM TECHNOLOGIES	89	3253	55.759026310238724
QUANTUM TECHNOLOGY	29	1407	48.02764268834307
QUANTUM EMITTERS	19	1935	42.12055260285498
SINGLE-PHOTON SOURCES	11	1231	37.82110660185736
QUBITS	24	16224	35.73105248330718
QUANTUM NETWORKS	11	2602	35.277939880548
SINGLE-PHOTON EMITTERS	6	466	33.78626875223724
TURING INSTABILITY	7	1010	33.37310177921439
QUANTUM ADIABATIC EVOLUTION	4	86	32.91172424717817
QDM	6	723	32.56006214123745
SIV CENTERS	4	100	32.55181643587673
ENTANGLEMENT	23	35322	32.14960530209979
PHOTONIC	19	25765	31.90875644495545
QUANTUM	40	93424	31.89105634400771
CAT STATES	5	443	31.711866387519088
DIRECT TOMOGRAPHY	3	24	31.622463991640554
SINGLE PHOTONS	9	4290	31.595885584917543
SPIN-PHOTON INTERFACE	4	167	31.328068307880955
QUANTUM SYSTEMS	13	13424	31.163104370514315
TELEPORTATION	8	3395	31.15245690157902

Overview of approach – Build queries

TITLE-ABS-KEY("Quantum technology")

Commit Submit

3,978 total results

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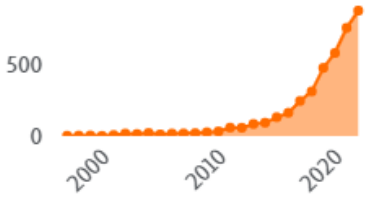
Output trend



Source types

- ☐ Journal (3,042)
- ☐ Conf. Proceeding (747)
- ☐ Book Series (84)

Future Networks, Services and Management: Underlay and Overlay, Edge, Applications, Slicing, Cloud, Space, AI/ML, and Quantum Computing (1 January 2021)

Quantum Computing and Its Impact (2-s2.0-85159032210)

Quantum technology is a rapidly advancing field which will revolutionize computing and communications networking. The use of quantum technology exploits the characteristics of quantum physics. In the quantum physics realm, subatomic particles don't follow the same set of rules as the objects we can see and touch. These differences allow new paradigms to be developed for computing and communications. Quantum computers can be used to solve previously unsolvable problems on a much larger scale. The Quantum Internet can exchange large amounts of data using quantum physics properties thereby reducing traffic on traditional communication networks. This section will detail some of the unique aspects of quantum technology.

Author keywords: Communications | Computing | Entanglement | Internet | Key distribution | Physics | Quantum | Qubit | Repeaters | Superdense | Superposition | Teleportation

Artificial Intelligence in Medicine (1 January 2022)

AIM in Nanomedicine (2-s2.0-85158953107)

Nanotechnology and its sister field of quantum technologies are interdisciplinary sciences that have been touted as one of the holy grails of technological advancements still yet to reach critical mass and unveil their transformative potential. Similarly, artificial intelligence and machine learning constitute another technological advancement that has captivated scientific hearts and minds, with both leading to next generation industrial revolutions. The unification of the latter and former technologies has thus elevated opportunities for exciting emerging discoveries and promises to offer further combinatorically exponential translational discoveries for medicine and humankind. This chapter explores the use of AI in the subfield of nanomedicine.We explore the applications of machine learning algorithms to aspects of drug discovery, toxicology and regenerative medicine, as well as medical and surgical robotics.

Author keywords: AI in nanomedicine | Drug delivery | Gold nanoparticles | Nano-neuroscience | Nanocarrier | Nanoethics | Nanoformulation | Nanorobotic | Nanotechnology | Quantum surgery

Subquery added X

You've successfully added query **"TITLE-ABS-KEY("Quantum technology")"** to dataset "Quantum Technology"

Overview of approach – Build queries

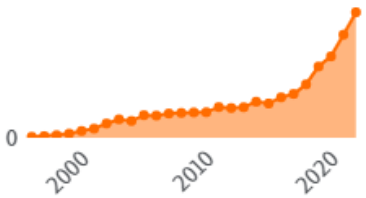
TITLE-ABS-KEY("Quantum computing" OR "Quantum key distribution" OR "Quantum metrology" OR "Quantum enhanced measurement" OR "quantum circuit" OR "quantum gate")

Commit Submit

30,715 total results

< Previous Page 1 of 1,229 Next >

Output trend



Source types

- ☐ Journal (20,672)
- ☐ Conf. Proceeding (7,962)
- ☐ Undefined (2)

Laser Physics (October 2004)

Quantum key distribution with a continuous alphabet (2-s2.0-9744275256)

A novel quantum key distribution protocol (QKD) based on all unselected states of a quantum system that set the alphabet with a continuous set of letters is proposed. Employing all states of the Hilbert space leads to a maximum quantum uncertainty of transmitted states, and, therefore, an eavesdropper receives the minimum amount of information. For the case of a two-dimensional Hilbert space, our protocol allows secure transmission at an error rate better than that for the BB84-protocpl and is comparable with the characteristics of the best known QKD protocols. However, with increasing the dimensionality of the Hilbert space, the critical error rate for our protocol increases and, in the limit of infinite-dimensional space, the protocol becomes non-threshold.

Author keywords:

Physica A: Statistical Mechanics and its Applications (15 January 2005)

Entanglement measure for the universal classes of fractons (2-s2.0-9744247591)

We introduce the notion of entanglement measure for the universal classes of fractons as an entanglement between occupation numbers of fractons in the lowest Landau levels and the rest of the many-body system of particles. This definition came as an entropy of the probability distribution á la Shannon. Fractons are charge-flux systems classified in universal classes of particles or quasiparticles labelled by a fractal or Hausdorff dimension defined within the interval 1 <h<2 and associated with the fractal quantum curves of such objects. They carry rational or irrational values of spin and the spin-statistics' connection occurs in this fractal approach to the fractional spin particles. We take into account the fractal von Neumann entropy associated with the fractal distribution function which each universal class of fractons satisfies. We consider the fractional quantum Hall effect (FQHE) given that fractons can model Hall states. According to our formulation entanglement between occupation numbers in this context increases with the universality classes of the quantum Hall transitions considered as fractal sets of dual topological quantum numbers filling factors. We verify that the Hall states have stronger entanglement between occupation numbers and so we can consider this resource for fracton quantum computing.

Author keywords: Entanglement | Fractal von Neumann entropy | Fractional quantum Hall effect | Fractons | Quantum computation

Overview of approach – Recall

Build query

Recall

Primary seed: NQTP- supported papers
No. of papers: 1,479
Retrieved papers: 1,056
Recall: 71%

Recall statistics

Number of publications in the recall set
Estimated recall

Current recall queries

Query	Number of documents	Added by	Time added
SRCTITLE("Quantum Information and Computation")	1,116	David Campbell	2023-05-29 at 17:31:53
SRCTITLE("Advanced Quantum Technologies")	343	David Campbell	2023-05-29 at 17:33:51

Add a recall query

Sample of missing documents

Missing documents are those documents found in the recall set but not the data set.

Sample of recalled documents

Recalled documents are those documents found both in the recall set and the data set.

Your results will appear here once a query is run

Overview of approach – Recall

Modify the recall query

Input:

SRCTITLE("Advanced Quantum Technologies")

Commit Submit

343 total results

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Output trend

Source types

☐ Journal (343)

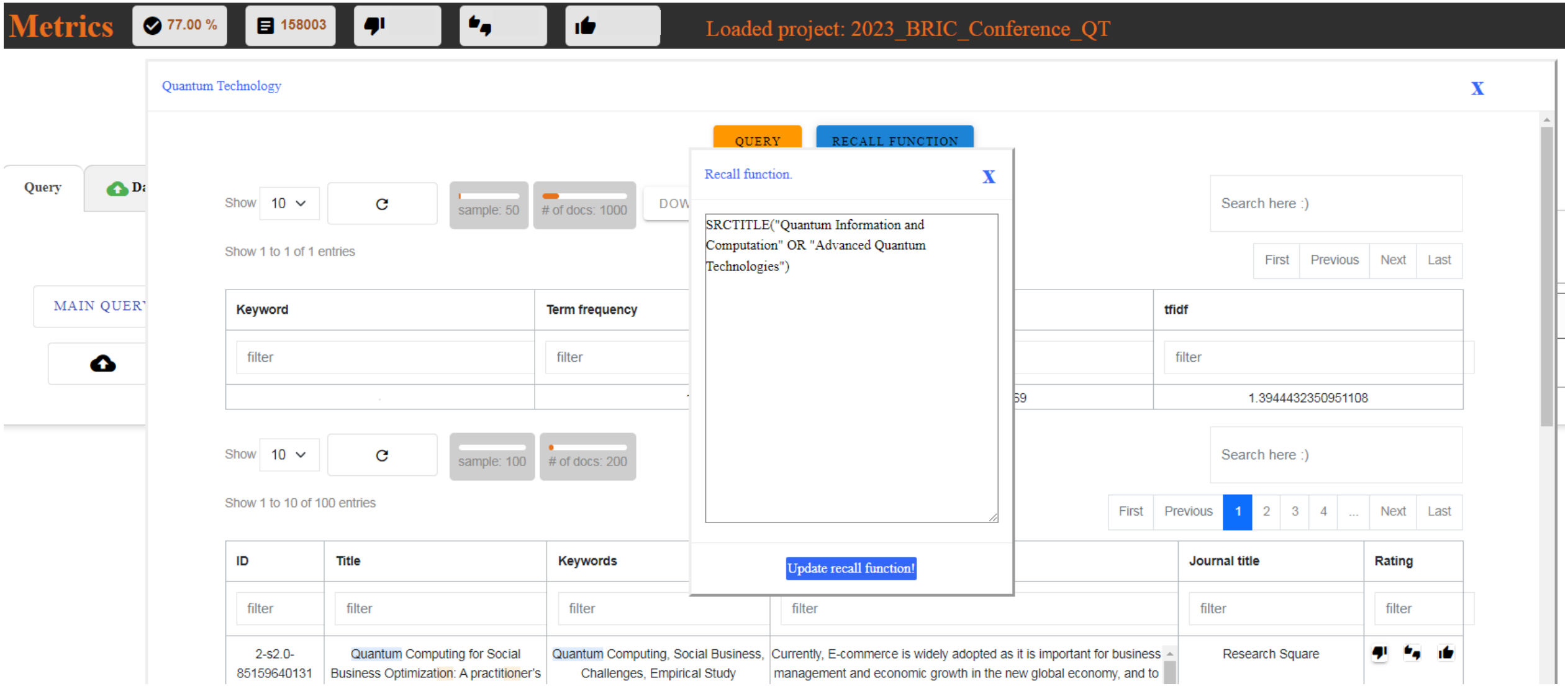
Advanced Quantum Technologies (December 2022)

Tunable Superconductivity in Phosphorus-Doped Topological Transition-Metal Germanide Mo<inf>5</inf>Ge<inf>3</inf> (2-s2.0-85140437183)

The effect of phosphorus doping in the transition metal germanide Mo5Ge3, which is predicted to be a nodal line semimetal and exhibits superconductivity below Tc = 0.75 K, is studied. It is found that Mo5Ge (Formula presented.) Px retains the tetragonal W5Si3-type structure up to x = 1.0, and the incorporation of phosphorus leads to a shrinkage of the unit cell volume. Remarkably, Tc of Mo5Ge (Formula presented.) Px is enhanced by more than one order of magnitude with increasing x, reaching 8.24 K at x = 1.0. This enhancement is attributed to the increases in both the density of states at the Fermi level and electron–phonon coupling strength. Theoretical calculations show that the phosphorus doping leads to a nearly rigid-band shift of the Fermi level into a local maximum of the density of states. This study unveils that transition metal germanides offer an emerging platform to study the interplay between superconductivity and nontrivial band topology.

Author keywords: enhancement of superconductivity | nodal line semimetal | phosphorus doping | rigid band shift | transition metal germanide

Overview of approach – Recall



Overview of approach – Precision

TITLE-ABS-KEY("SPAD")

Commit Submit

7,199 total results

Precision = 16%

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Biologia Plantarum (2004)

Effects of boron on growth, and chlorophyll and mineral contents of shoots of the apple rootstock MM 106 cultured in vitro (2-s2.0-8544262247)

The in vitro cultures of apple rootstock MM 106 produced the highest fresh mass (FM) when 0.1 mM B was included in the culture medium. By increasing B concentration of the culture medium from 0.1 to 6.0 mM, FM and contents of B, P, Ca, and Mg in explants increased, whereas K, Fe, Mn, and Zn contents decreased. SPAD units of leaves characterizing chlorophyll contents declined as B concentration of the culture medium increased from 0.1 to 6.0 mM.

Author keywords: cell proliferation | micropropagation | mineral nutrition

Soil Plant Analysis Development (SPAD) chlorophyll meter

Proceedings - 2022 12th International Conference on Information Technology in Medicine and Education, ITME 2022 (2022)

A Single Photon Counting Ranging System Tolerating 100Klux Background light (2-s2.0-85153937782)

In this paper, a single photon ranging system is proposed and designed. The depth data processing and acquisition are completed on the SOC chip, and 60 × 1 dynamically adjustable SPAD array pixels are integrated. The histogram distribution of photon arrival time is realized based on TCSPC. The histogram algorithm is implemented in MCU firmware, which can resist outdoor strong light, the system is shown to work up to 100 Klux of background light with depth error lower than 15 mm at 1000 mm.

Author keywords: background light suppression | component | direct time-of-flight | SPAD

Single-Photon Avalanche Diode

Overview of approach – Precision

TITLE-ABS-KEY("SPAD" AND NOT ("leaf" OR "plant" OR "soil" OR "nitrogen" OR "Signal Passed at Danger" OR "photosynthesis" OR "chlorophyll"))

Commit Submit

Precision = 100%

2,509 total results

Low-Power Analog Techniques, Sensors for Mobile Devices, and Energy Efficient Amplifiers: Advances in Analog Circuit Design 2018 (1 January 2019)

Time of Flight Imaging and Sensing for Mobile Applications (2-s2.0-85149566853)

Optical sensors, based on the time correlated single photon counting (TCSPC) technique, are found in a range of applications from medical to consumer. This chapter provides an overview of the challenges in TCSPC sensor design for mobile applications. We describe the design of a proof-of-concept TCSPC optical sensor with 10 GS/s conversion rate folded flash time to digital converter (TDC) and on-chip histogram generation, designed to minimize time-domain distortion and have high power efficiency. The proof of concept IC is fabricated in STMicroelectronics 130 nm SPAD foundry process. The system consumes 178.1 pJ per photon at 899 M photon/s, and the TDC achieves state of the art 0.48 pJ/S energy efficiency.

Author keywords:

INDICON 2022 - 2022 IEEE 19th India Council International Conference (2022)

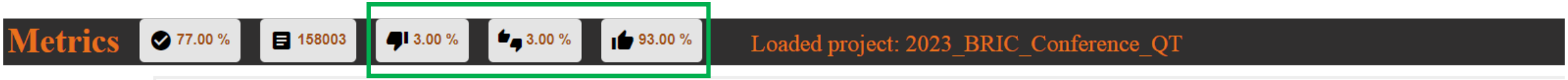
Fabrication and Electrical Measurements of CMOS-integrated GM-APDs and Test Structures in 180nm CMOS Technology Platform

(2-s2.0-85149217015)

This paper presents the fabrication, TCAD simulation and electrical characterization activities carried out in the development of Geiger mode APDs (GM-APDs) utilizing SCL's 180nm CMOS process. Two additional mask-steps and a custom anneal cycle was integrated into standard CMOS flow for the fabrication of GM-APDs. Custom anneal cycle was introduced in such a way that thermal budget of CMOS process was not disturbed. Fabricated SiPM device (array size: 1.5x1.5 mm2, pixel size: 35x35 um2, No. of pixel: 1156) exhibited dark current (at < VBD) is less than 10nA/cm-2. Process splits were implemented to analyse the effect of implant dose on breakdown (BD) voltage and measured breakdown voltage ranges from 15 to 21V. These splits were supported by 2D TCAD process and device simulation. 61% and 23% geometrical fill factor was achieved for 35x35 um2 and 10x10 um2 pixel size respectively. Standard CMOS p-well implant (over trench) was used to separate adjacent pixels. Test structures were also characterized to establish relation between edge breakdown voltage and n+/isolation p-well implant separation. The distance between n+ and isolation p-well contributes in dead area which affects the fill factor of the devices. Functionality of the device was verified by the dark events observed in digital oscilloscope. DCR of a SPAD measured less than 20 cps/um2 at 1V excess bias.

Author keywords: avalanche breakdown | CMOS | GM-APDs | photodiodes | Silicon Photomultipliers

Overview of approach – Precision



Quantum Technology

2-s2.0-8744282740	Comparison of four multi-user quantum key distribution schemes over passive optical networks	Multiplexing, Probability, Optical Networks, Topology, Interferometers, Network Protocols, Key Distribution Schemes, Attenuation, Bit Error Rate, Optical Fibers, Quantum Bit Error Rate (QBER), Light Transmission, Quantum Key	The performance of multi-user quantum key distribution systems is compared for four different optical network topologies: Sagnac-based fiber ring, wavelength routed, passive star and bus. Their performances are analyzed using quantum bit error rate analysis. © 2003 Optical Society of America.	OSA Trends in Optics and Photonics Series	
2-s2.0-8744284488	A novel time-frequency quantum key distribution technique for optical fiber communication systems	Fiber Optics, Multiplexing, Quantum Optics, Telecommunication Networks, Photons, Optical Networks, Time-frequency Quantum Key Distribution, Quantum Theory, Photon Pulses, Network Protocols, Optical Fiber Communication	We propose a new quantum encryption scheme that is based on the quantum mechanical duality between time and frequency. We described an experimental implementation using optical fiber and discuss the new protocol's security against eavesdropping. © 2003 Optical Society of America.	OSA Trends in Optics and Photonics Series	
2-s2.0-85159673296	Solving Graph Problems Using Gaussian Boson Sampling	Gaussians, System Size, Quantum Chemistry, Quantum Device, Stochastic Algorithms, Computational Advantages, Real-world Problem, Quantum Computers, Photonic Processors, Stochastic Systems, Bosons	Gaussian boson sampling (GBS) is not only a feasible protocol for demonstrating quantum computational advantage, but also mathematically associated with certain graph-related and quantum chemistry problems. In particular, it is proposed that the generated samples from the GBS could be harnessed to enhance the classical stochastic algorithms in searching some graph features. Here, we use Jiŭzhāng, a noisy intermediate-scale quantum computer, to solve	Physical Review Letters	

Precision = we stopped improving the overall query at about 92-93% with a recall of 70%

Conclusion

- **Keyword-based approach**
  - **Advantage(s):** Transparency, reproducibility, ease of interpretation by a human
  - **Disadvantage(s):** Time-consuming, assessment of recall/precision can be challenging for non-experts
- **AI-based approach**
  - **Advantage(s):** Fast and less time-consuming, results can still be assessed for precision even if black box
  - **Disadvantage(s):** Logical black box (even with methodological details on the algorithm and training/testing sets), more challenging to fine tune the balance of precision/recall
- **Tool is under construction**
  - Currently for internal use in bibliometric studies
  - We would like to hear from you on the suitability of such a tool in support of your work. Please fill out this short survey and feel free to share within your network: https://forms.office.com/r/H7Vc8Y15ZQ
- **Can you think of other useful features you would like to see added to such a tool?**
  - AI features to assist in dataset creation (maybe this could replace a keyword-based approach in some cases)

Thank you!

Analytical and Data Services

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Minerva Tool Feedback Survey