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INDUSTRY FOCUS

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BEYOND SQL: 8 NEW LANGUAGES FOR DATA QUERYING



SQL has dominated data querying for decades. Newer query languages offer more elegance, simplicity, and flexibility for modern use cases.

1. GRAPHQL

The name of GraphQL is a bit confusing because it's not really a language designed to exploit all of the possibilities from graph databases. It's more like an elegant shorthand for querying data that's stored in nested format similar to JSON. The guery is just a guick description of what the results should look like. The back end looks at this list of fields, which can come with restrictions on the values, and tries to find the results that match. Where SQL specifies how the database should complete a request, GraphQL users simply provide a list of fields. Some call it "query by example." The language is a natural match for some JSON databases, but GraphQL is also growing more popular for searching relational databases with a tabular schema. Smart back ends can translate the nested requests into a pattern of JOINs that fits the schema.

2. PROL

If you naturally think of software as a pipeline or an assembly language, then you might like PRQL, which stands for Pipelined Relational Query Language (pronounced "Prequel"). Queries in this language are structured as a chain of small commands. Taken together, the commands produce a result with just the data you want.

Similar to many modern programming languages, the mental model of a query takes a functional approach. Simple features like variables reduce repetition and simplify the flow. The results from one line are fed into the next line in a long chain. If you want to remove one step, you can often just comment out that line and the rest of the pipeline will still work.

PRQL's code is written in Rust as a transpiler for converting PRQL into SQL. The basic structure is meant to be extensible, so you can add more abstractions to suit your use case. This ease of experimentation ensures that the language will rapidly evolve.

3. WEBASSEMBLY

Many developers think of WebAssembly (abbreviated Wasm) as a tool for creating fast applications that run in web browsers. When Redpanda began building a data streaming tool to supersede Kafka, they wanted to add a mechanism for not only delivering the data but occasionally transforming it along the way. WebAssembly was their choice.

Redpanda acts as a ledger by creating a data stream that's immutable and ordered. Events are appended and programmers can tap into the stream at any point in the past. Most will start with newly created events, but some may start in the past to create historical aggregations.

WebAssembly, of course, is much more capable and low level than even the stored procedures that are part of some databases. Not all developers want to write bit-banging, byte-level code. But the option opens up the data stream to elaborate transformations that go well beyond what is possible with SQL.

4. GQL

Graph Query Language, or GQL, is a proposed standard that merges similar declarative languages like Cypher, PGQL, and GSQL. Developers create queries by specifying a particular model for a set of nodes, and then the database is responsible for finding matches. GQL works with more complex property graphs that allow pairs of nodes to share several different connections.

WHAT'S HOT

The standard is under active development. Currently, the best implementations are research tools that aren't intended for long-term deployment.

5. GREMLIN

One of the original languages for searching a graph, Gremlin asks for a set of steps for searching through the connections between nodes. Some call it a "path-based" or "graph traversal" language. Each query is built on steps, and each step can involve either mapping the current node, filtering a list, or somehow tabulating the result.

The language is often just a starting point. Some, for instance, are expanding Gremlin by embedding a Python interpreter inside it so that queries can include Python code. Others are embedding Gremlin inside a standard programming language like Java so that programmers can tap the power of Gremlin from inside that language.

Gremlin was first built for Apache's TinkerPop project and it's been adopted by major transactional graph databases like Amazon's Neptune and graph processing frameworks using Apache Spark or Hadoop.



6. **N1QL**

Over the years, Couchbase has searched for the best way to query general documents. In the beginning, the query was written as a JavaScript function that was handed to the database for execution. It was a nice, general solution that sometimes took forever to generate a result, but it required programmers to think a bit differently.

N1QL (pronounced "nickel") is designed to make it easier for SQL natives to work with the JSON objects that might be stored in Couchbase. A basic query has several sections specified by the keywords SELECT, FROM, and WHERE, just like SQL. The details of specifying the path into the data structure from which the data will come is adjusted and adapted to the nested world of JSON objects.

To encourage experimentation, N1QL offers a querying workbench with a visual interface for testing and refining queries. Couchbase also offers a generic full-text search option that runs independently for queries seeking text words instead of structured data.

7. MALLOY

The problem with SQL, according to the creators of Malloy, lies in the syntactic details. Expressing even the simplest query takes time because the language is verbose and full of hidden performance traps. So, they created a modern programming language with natural defaults and simpler syntax that can be compiled to SQL, so no one needs to retrofit a stock database.

The result is a syntax that resembles a more powerful GraphQL.

A query is more like a model or vision for the result, including any restrictions, matches, or defaults. Malloy handles some optimization in the background. Smarter JOINs, for instance, can be generated automatically to avoid chasm and fan performance traps. Subqueries can be aggregated to save time. Indices are also added as needed. As a result, writing queries feels more like writing modern code, with punctuation serving to keep the structure succinct.

Malloy's open source core is built out in TypeScript for including in Node.js code. A VS Code plugin simplifies development.

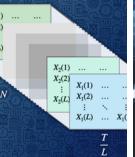
8. **BASIS**

Most query languages are tied directly to a particular database. Basis is building more of a pipeline that can draw from a variety of sources before filtering them with a mixture of SQL and Python. At the end of the pipeline are exporters that deliver the data to a variety of standard options, which range from running code to AI algorithms to charts and dashboards.

Developers are already building pipelines like this in their own code, and many projects depend on similar structures. Basis offers a prebuilt option that can be customized in more elaborate ways. Inputs range from standard database queries to API taps to custom Python code. The transformers aren't limited to SQL's basic WHERE clauses because you can write Python code that does more than filter as the data flows down the pipeline.

Basis is just one example of newer data pipeline tools that are opening up the querying process to draw from more than one source, filter with more than one language, and deliver the data in more than one form. It's a vision of being able to take data from almost any source and deliver it to almost any consumer.//

Source: infoworld













HEALDLINE NEWS IN A FLASH

A TOOL FOR PREDICTING THE FUTURE

Making predictions using time-series data typically requires several data-processing steps and the use of complex machine-learning algorithms, which have such a steep learning curve they aren't readily accessible to nonexperts. To make these powerful tools more userfriendly, MIT researchers developed a system that directly integrates prediction functionality on top of an existing time-series database. Their simplified interface, which they call tspDB (time series predict database), does all the complex modeling behind the scenes so a nonexpert can easily generate a prediction in only a few seconds. The new system is more accurate and more efficient than state-of-the-art deep learning methods when performing two tasks: predicting future values and filling in missing data points. One reason tspDB is so successful is that it incorporates a novel time-series-prediction algorithm. This algorithm is especially effective at making predictions on multivariate time-series data, which are data that have more than one time-dependent variable. In a weather database, for instance, temperature, dew point, and cloud cover each depend on their past values.//

Source: news.mit.edu

MODERN WAR: UKRAINE IS USING CLEARVIEW FACIAL ID ON DEAD RUSSIAN SOLDIERS

t has come to this: Ukraine confirmed late last week that it is utilizing Clearview Al's controversial facial ID and data scraping technology to assist in identifying some of the thousands of dead Russian soldiers killed during the ongoing war instigated by Vladimir Putin's government. Speaking with Reuters, Ukrainian vice prime minister Mykhailo Fedorov explained that the tech was specifically being used to match deceased men's faces with social media account photos.//

Source: inputmag

ARTIFICIAL INTELLIGENCE BEATS EIGHT WORLD CHAMPIONS AT BRIDGE

An artificial intelligence has beaten eight world champions at bridge, a game in which human supremacy has resisted the march of the machines until now. The victory represents a new milestone for Al because in bridge players work with incomplete information and must react to the behaviour of several other players – a scenario far closer to human decision-making. In contrast, chess and Go – in both of which Als have already beaten human champions – a player has a single opponent at a time and both are in possession of all the information. "What we've seen represents a fundamentally important advance in the state of artificial intelligence systems," said Stephen Muggleton, a professor of machine learning at Imperial College London.//

Source: theguardian

INTEL DEBUTS 'WORLD'S FASTEST' DESKTOP PROCESSOR

Intel Corp. detailed the Core i9-12900KS, a new central processing unit that it touts as the world's fastest desktop processor. The introduction of the CPU comes shortly after Advanced Micro Devices Inc. debuted a competing chip also described as the world's fastest desktop processor. The newly detailed i9-12900KS is based on Intel's Alder Lake chip architecture. CPUs that use the Alder Lake architecture are made with Intel's latest 10-nanometer semiconductor manufacturing process. They also support PCle 5.0, a technology that allows a CPU to more quickly transfer data to and from the other components of the computer in which it's running, which increases performance.//

Source: siliconangle

CLIMATE GROUPS SAY A CHANGE IN CODING CAN REDUCE BITCOIN ENERGY CONSUMPTION BY 99%

Bitcoin mining already uses as much energy as Sweden, according to some reports, and its booming popularity is revitalizing failing fossil fuel enterprises in the US. But all that could change with a simple switch in the way it is coded, according to a campaign launched on Tuesday. The software code that bitcoin uses – known as "proof of work" – requires the use of massive computer arrays to validate and secure transactions. Proof of work is a way of checking that a miner has solved the extremely complex cryptographic puzzles needed to add to the bitcoin ledger. Rival cryptocurrency etherium is shifting to another system – "proof of stake" – that it believes will reduce its energy use by 99%. In the proof of stake model, miners pledge their coins to verify transactions; adding inaccurate information leads to penalties.//

Source: theguardian

AN AI EXPERIMENT GENERATED 40,000 HYPOTHETICAL BIOWEAPONS IN JUST 6 HOURS

New research emphasizes how easily AI models can be trained for malicious purposes as well as good, specifically in this case to imagine the designs for hypothetical bioweapon agents. A trial run with an existing AI identified 40,000 such bioweapon chemicals in the space of only six hours. In other words, while AI can be incredibly powerful – and much, much faster than humans – when it comes to spotting chemical combinations and drug compounds to improve our health, the same power can be used to dream up potentially very dangerous and deadly substances. "We have spent decades using computers and AI to improve human health – not to degrade it," the researchers write in a new commentary. The team ran the trial at an international security conference, putting an AI system called MegaSyn to work – not in its normal mode of operation, which is to detect toxicity in molecules in order to avoid them, but to do the opposite.//

Source: sciencealert

05



INDUSTRIAL ENGINEERING IS NOT A LIFE SCIENCE, BUT A SCIENCE FOR QUALITY OF LIFE

This article is an excerption from a special speech by Dr. Yılmaz Argüden, Chairman of ARGE Consulting, and Rothschild & Co Türkiye. Chairman of Trustees, Argüden Governance Academy.



During my studies I realized that industrial engineering instills an important understanding for life: continuous improvement, which is both a curse and a blessing. Industrial engineers are never satisfied with any success, as we know that we can always do better. Perfection is an ideal that we always pursue, with the knowledge that it will never be reached. Therefore, we are doomed for failure to reach perfection, while blessed to continually seek a better solution! However, this understanding is the **key motivation for life-long learning**. Curiosity to learn more and the will to always pursue the better has served me well, as I am never satisfied and start preparing for the next conquest, right after each achievement.



Preparing for the future conquests requires building a vision for the future and having the discipline to build your skills for it.

Therefore, I have learned the importance of thinking for the future, imagining what can be done, and consistently working to build the envisioned future. As Einstein has said 'Imagination is more important than knowledge.' We can acquire knowledge, but first we need to have a vision of the future we want.

One of the first things we learn at industrial engineering is to define the objective function properly. When I started my first on-the-job training program as a summer intern at the newly established R&D Center for Koç Holding, my first task was to clean up a room filled with books and periodicals. In setting up my objective function, I had focused on value creation and redefined the problem from room cleaning to identifying key information that would be useful for research and making it accessible.

Such a redefinition led me to organize the room with a precision of a librarian, develop multiple cards for each publication that are classified by author, subject matter, and statistical information, as well as the table of contents. Such an approach landed me an opportunity to be employed part-time throughout the school year and full time during the summers. This in turn gave me an opportunity to seek real life problems from Koç Holding companies to solve, each time I had to prepare a class project, such as utilizing the traveling salesman problem to develop a logistical distribution system, factory layout optimization, building a cost accounting system for a foundry, and so forth.

Therefore, I have not only started working as an industrial engineer before graduation, but also got much better appreciation of data collection, relevance of assumptions, and making the models user friendly for others to utilize them. In short, **redefining the problem and the objective function** has been one of the most effective ways to create value throughout my career.



The impact of this experience on my learning journey was instrumental in deciding to pursue a doctorate in strategy and policy analysis at the RAND Graduate School. Particularly, since on-the-job training through RAND's research projects was an integral part of the program. One of the key lessons I have learned from the game theorist Lloyd Shapley, who later won the Nobel Prize in Economics, was how life is a set of repetitive games and why we need to build trust among the players, align the incentives, and adopt long-term thinking for sustainable solutions. My thesis was about the impact of long-term incentives on short-term decisions and how to utilize rational expectations theory to develop incentive systems.

After getting my Ph.D. I started to work for the World Bank. I have managed a portfolio of over 600 loans in 20 different countries. This particular experience gave me an appreciation of Peter Drucker's quote of 'Culture eats strategy over breakfast' and Einstein's quote of 'Problems cannot be solved with the same thinking that created them in the first place.' Understanding of the importance of conditionality for better public governance and the relevance of administrative details for effective implementation, led me to propose an initiative to build much better donor coordination. I was given the responsibility to serve as the World Bank's representative to build such a collaboration among all the sub-Saharan country donors. This initiative has taught me that in real life you should not always shoot for optimization, as we industrial engineers are wired for, but we should learn to accept 'good' solutions (satisficing) to make progress especially when multiple parties with multiple objective functions are involved.

After returning to Türkiye in 1988, upon my government's invitation to head the privatization program and later serving as the Chief Economic Advisor to the Prime Minister, I was asked to help improve the competitiveness of the Turkish economy.



Systems thinking led me first to get the climate right, by establishing the right rules, regulations, and incentives for the economic actors.

One of the first steps we took was to list some of the government owned company shares in the Istanbul Stock Exchange to help develop a culture of share ownership in the country. Another item was to start implementing antitrust controls even before such a regulation was enacted through share sale agreements, as a predecessor to the establishment of the Competition Authority. During this period, largest foreign direct investments were attracted, and non-performing publicly owned assets were turned into active investments that flourished under private ownership.

When I founded ARGE Consulting in 1991, Türkiye was about to get into Customs Union with the EU, and the Turkish industry needed to upgrade its quality. Therefore, our first projects were related to quality improvement issues. Soon I realized that quality was not just a technical issue, but rather a cultural issue and that we needed a shift in mentality from controlling product quality to improving management quality, from adhering a set of standards to exceeding expectations, from focusing on your own factories to a focusing on the whole value chain, and even further to the whole of the community.

Therefore, when I was elected as the Chairman of National Quality Association, KalDer, we have built a board that included not only leaders from different industries, but also from SMEs, public sector, and NGOs that led us to develop the National Quality Movement that encompassed not only the corporate sector, but also the public sector and the NGOs.



From the theory of constraints, industrial engineers know well that optimum generally lies at the boundary of the feasible region and that in order to achieve a better solution we need to relax the active constraints.

We realized that the most important constraint that needed to be relaxed was to increase the speed of learning to achieve the goals of the National Quality Movement. Therefore, we have developed Award Schemes to promote good examples, asked the award winners to open their experiences to others to help benchmarking, and developed education programs as well as 'train the trainer' programs to speed up national deployment. As a result, Turkish companies became top EFQM European Quality Award winners, Turkish automotive industry became our top export industry, and quality initiatives were adopted by the public sector.

Motivated by Kofi Annan's Davos speech in 1999, I had the honor of assuming a number of leadership positions at the UN Global Compact, the largest global sustainability platform by becoming the first Turkish signatory, first National Representative, Founding Chair of the Turkish Network, Global Chair of the Local Networks, and eventually serving on its Global Board. With a systemsthinking, we have introduced many innovations such as the Sectoral Deployment Strategy for motivating a collaborative effort that led to biggest membership drive, Leveraging Natural Allies Strategy with a win-win-win strategy that led to the signing of Sustainable Finance Declaration by leading Turkish banks, and the idea of Aligning Incentives with the World We Want to help the world get to a more sustainable and better future. As a result, the Turkish Network won the Best Local Network Award in 2014.



One of the key concepts in our profession is to <u>look for the</u> <u>root cause</u> and focus the improvements on the root cause for sustainable success. Having assumed responsibilities at the public sector, private sector, and NGOs throughout my career, my awareness of the importance of good governance as the root cause for improving quality of life was greatly enhanced. There are two basic reasons for forming institutions:

- (i) more effective utilization of resources and
- (ii) better risk management.

Yet if the institutions are not trusted by their stakeholders. they cannot achieve these goals economically. Governance improves quality of management and trust of stakeholders. As lack of trust is like a high coefficient of friction; everything you do just costs more. Good governance is a culture and a climate in which trust for institutions flourish. I have published numerous books and articles to share the how and why of good governance, notably "Boardroom Secrets" and "Keys to Governance" and articles about diversity and measuring quality of governance at publications such as HBR and INSEAD Knowledge. These efforts led me to be elected as a member of IFC Corporate Governance Advisory Group, as well as to serve as Chair of Governance Committee of Business at OECD, and as B20 Knowledge Partner on Governance and Sustainability.

These responsibilities led me to appreciate the importance of "good governance for sustainable success of institutions". Therefore, we founded the non-profit Argüden Governance Academy to improve quality of life and sustainability of the future by improving quality of governance. The Academy targets not only leaders of private sector companies, but also NGOs, public institutions, and international organizations; as well as individuals of all ages, from 7 to 77.

We develop education programs such as "Governance for Kids" and "GOV101" for youth leaders as well as public, private and NGO leaders. We also develop unique methodologies to measure effectiveness of governance, as per the dictum "You cannot improve what you don't measure." Identifying and promoting good examples help speed up global learning from peers, an important lesson learned from the quest for continuous improvement. Therefore, our research projects such as "Municipality Governance Scorecard" & "Sustainability Governance Scorecard" are recognized as impact-research for public good.

In short, my industrial engineering training has served me well in many different domains to help improve quality of life.

I am sure that you are noticing a pattern in all these endeavors that comes from an <u>integrated systems</u> <u>thinking</u>:

- · devise a vision that encompasses all the stakeholders,
- · build a diverse team fit for purpose,
- · identify infliction points to focus the change efforts,
- align the incentives of key stakeholders to mobilize resources behind the vision,
- focus not only on immediate results but also on speeding up learning for long-term impact,
- reward and promote the good examples to motivate others to join the movement, and
- plan for a smooth succession to a new leader who really understands and appreciates the initiative to hand over the baton.

Industrial engineers develop advanced critical thinking, analytic, and problem-solving skills, as well as ability to work with diverse group of people that requires strong interpersonal skills.

DR. YILMAZ ARGÜDEN RECEIVES THE DISTINGUISHED INDUSTRY LEADERSHIP AWARD Dr. Yılmaz Argüden, Founder and Chairman of ARGE Consulting, was recognized with the Distinguished Industry Leadership Award by the International Industrial Engineering Society.

12th Annual International Engineering Society.

12th Annual Interna

This combination provides an opportunity for systems thinking, innovation, and creativity. It is no coincidence that industry shapers such as Henry Ford who revolutionized industrial production by being the first to apply assembly line manufacturing to a production process and Taiichi Ohno "father of the Toyota Production System", also known as Just-InTime are industrial engineers. I sincerely believe that the future bodes well for our profession as well:

- Industrial engineers have unique strengths in evidence-based decision-making. They deeply understand how to organize, interpret, and process data.
- They are system thinkers who take a holistic approach to analyzing the complexity of any problem and examine it from all angles.
- They have curiosity, grit, and adaptability to solve complex business problems under a VUCA environment (volatility, complexity, uncertainty, ambiguity).
- They understand how to communicate with an interdisciplinary team with a diversity of skills, methodologies, and knowledge to create success.

It is not a coincidence that the first Turkish originated international decacorn is going to be Getir, an ultrafast delivery service that promises groceries shipped to customers' doors in just 10 minutes to improve the quality of life for millions by delivering what people want. It operates in over 120 cities in 10 countries. Getir is basically an industrial engineering project that involves location optimization, stock optimization, route optimization with big data, and artificial intelligence. Other hot topics such as pricing, revenue management, and digital marketing are all within the skill set of industrial engineers.

Industrial engineers work in every sector, understand big data, focus on processes, and solve many problems. Many, such as Tim Cook of Apple, assume top executive and board level responsibilities as their integrated systems thinking is critical in these positions to help improve quality of life.

In summary, industrial engineering is not a life science, but a science for improving quality of life. It has helped me in delivering my promise to my father, and I am confident it has the potential to deliver the dreams of each and everyone in this profession.//

Source: ARGE Consulting





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