Relational Database Management Systems (RDBMS) using SQL are schema oriented (Blaha *et al*., 1994), i.e., their structure must be given to make sure data abides by such a schema, such as in finance with payroll and accounting systems. Therefore, SQL cannot ingest unstructured data. Instead, Big Data requires adaptable database systems that are not constrained by a set schema (Begoli *et al*., 2016). SQL DBs are vertically scalable (Blaha *et al*., 1994), thus requiring hardware of increasing capacity with increases in the volume of data and being very expensive when dealing with large amounts of data. Moreover, their relatively low performance (Blaha *et al*., 1994) is one of the main limitations in such scenarios.

Conversely, NoSQL DBs are designed with Big Data and cloud computing in mind, thus not being constrained by a pre-defined schema and scaling horizontally (Begoli *et al*., 2016). Relational DBs are part of NoSQL (‘Not Only SQL’) DBs, which also include DBs handling unstructured data, such as key-value pairs (Liu *et al*., 2014), and Graph DBs. Big Data applications require DBs that have continuous availability (NoSQL).

Graph DBs are online DBs with CRUD operations applied to data stored in a graph-like manner (Singh & Kaur, 2015). Graph DBs consist of nodes and edges/relationships (Angles *et al*., 2017), respectively defining an entity and how multiple entities related to one another. This flexible data model enables to store network-like data, e.g., from population health (Gamal *et al*., 2021) to applications involving fraud detection (Bajer *et al*., 2021), thus not only handling significant amounts of data but also providing a method to gain fast and visual insights from them. Thus, the Graph data model is simpler and more flexible than RDBMS for such use cases, as schema-less (Angles *et al*., 2017). Traversing a Graph DB is computationally efficient by graph processing (Bajer *et al*., 2021; Gamal *et al*., 2021) considering that nodes that are interconnected relate to one another at the DB level. Differently from RDBMS, not only the data are considered individually, but as an ensemble of relationships (Bajer *et al*., 2021; Gamal *et al*., 2021) to yield fast and valuable insights from them. Relationships and business rules can be created and modified easily in a Graph DB (Angles *et al*., 2017), whereas in a RDBMS it would be hard to maintain them as constrained to abide by pre-defined schemas.

Companies leveraging Big Data at scale worldwide, such as Google and those owning social media platforms (Desai *et al*., 2019; Hryhoruk & Leung, 2021), e.g., LinkedIn and Meta, use Graph DBs to handle such significant volumes of data and draw insights that generate value by representing them as networks, in a graph-like manner. In Graph DBs, performance is constant, thus enabling to query them fast, independently of increases in the size of the DB, whilst RDBMS’ performance is impacted considerably as the data points and their relationships increase (Angles *et al*., 2017).

**References**

Angles, R., Arenas, M., Barceló, P., Hogan, A., Reutter, J., & Vrgoč, D. (2017) Foundations of modern query languages for graph databases. *ACM Computing Surveys (CSUR)* 50(5): 1-40.

Bajer, K., Seidlitz, A., Steltgens, S., & Wormuth, B. (2021) Graph Databases. In *The Digital Journey of Banking and Insurance, Volume III*: 35-49. Palgrave Macmillan, Cham.

Begoli, E., Dunning, T., & Frasure, C. (2016) Real-time discovery services over large, heterogeneous and complex healthcare datasets using schema-less, column-oriented methods. In *2016 IEEE Second International Conference on Big Data Computing Service and Applications (BigDataService)*: 257-264. IEEE.

Blaha, M., Premerlani, W., & Shen, H. (1994) Converting OO models into RDBMS schema. *IEEE software* 11(3): 28-39.

Desai, M., Mehta, R. G., & Rana, D. P. (2019) An empirical analysis to identify the effect of indexing on influence detection using graph databases. *Int. J. Innov. Technol. Exploring Eng* *8*: 414-421.

Gamal, A., Barakat, S., & Rezk, A. (2021) Standardized electronic health record data modeling and persistence: A comparative review. *Journal of biomedical informatics* *114*: 103670.

Hryhoruk, C. C., & Leung, C. K. (2021) Compressing and mining social network data. In *Proceedings of the 2021 IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining*: 545-552.

Liu, Z. H., Hammerschmidt, B., & McMahon, D. (2014) JSON data management: supporting schema-less development in RDBMS. In *Proceedings of the 2014 ACM SIGMOD international conference on Management of data*: 1247-1258.

Singh, M., & Kaur, K. (2015) SQL2Neo: Moving health-care data from relational to graph databases. In *2015 IEEE International Advance Computing Conference (IACC)*: 721-725. IEEE.