

**[ Python Metaprogramming+Z3Py-Python Theorem Prover+ImageAI ] in the Context of Radiation Oncology & [ IoT/HPC ]- High Performance Computing Heterogeneous Informatics R&D – An Interesting Insight into the World of Metaprogramming Concepts With a Useful Review.**

[ Exploring Metaprogramming+AI → to Probe Complex Design Patterns → Next Generation Medical Software R&D ]

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**[I] Inspiration+Introduction :**

“ One of the most important things that programmers should keep in mind is “do not repeat yourself”. This means that programmers should not repeat the same code – in fact, they must re-use the code. Programmers must look for an elegant solution when they faced any problem of creating highly repetitive code. In Python, this problem can be solved using the concept of meta-programming. “

[ Source - <https://www.w3schools.in/python-tutorial/metaprogramming/> ]

<https://www.contentful.com/blog/2017/03/17/snake-charmers-secret-metaprogramming-the-python-sdk/>

<http://www.discoversdk.com/blog/metaprogramming-with-metaclass-in-python>

“IPL is a C++ template meta-programming based Image Processing Library designed for quick and easy implementation of Computer Vision and Computer Graphics algorithms while preserving runtime performance. Integrates with Qt, LibPNG, and FFmpeg “ – [ Source - <https://github.com/Argoday/IPL> – An example ]

<https://www.quora.com/What-is-metaprogramming> – Some Commentary on Metaprogramming.

<https://bytes.com/topic/python/answers/801274-metaprogramming-example>

“ Just like metadata is data about data, metaprogramming is writing programs that manipulate programs. It’s a common perception that metaprograms are the programs that generate other programs. But the paradigm is even broader. All of the programs designed to read, analyze, transform, or modify themselves are examples of metaprogramming. Some examples include:

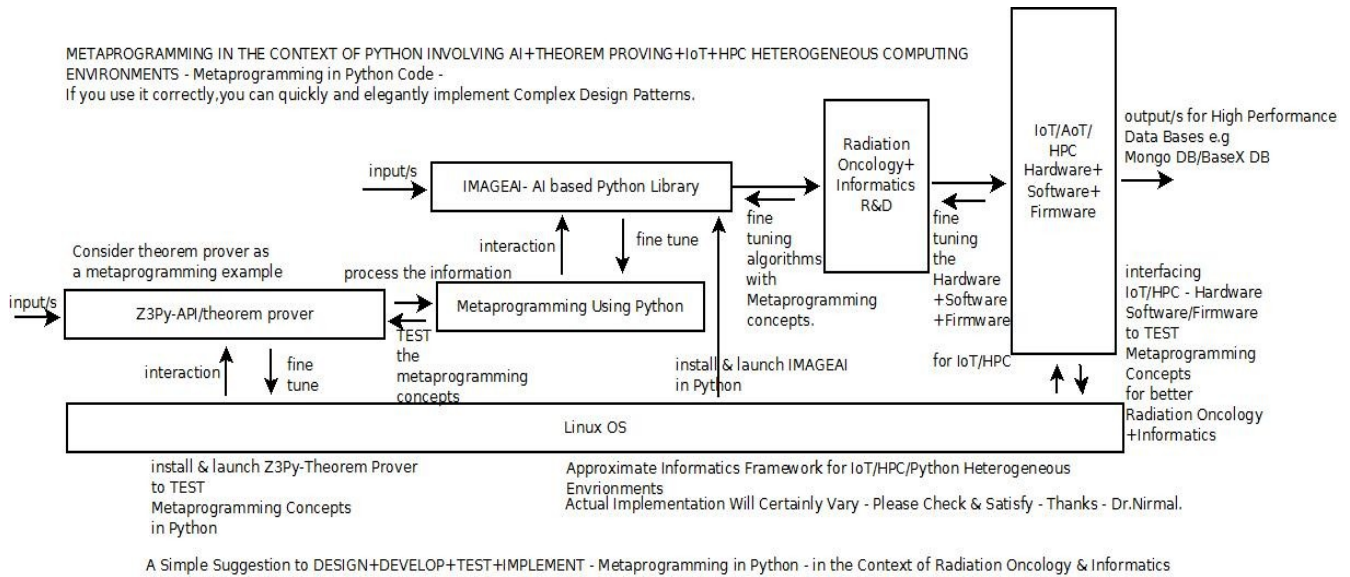
- Domain-specific languages (DSLs)
- Parsers
- Interpreters
- Compilers
- Theorem provers
- Term rewriters “.

[ Source - <https://developer.ibm.com/tutorials/ba-metaprogramming-python/> ]

<https://www.theabr.org/radiation-oncology> && <https://www.itnonline.com/article/future-radiation-oncology>

[https://www.hopkinsmedicine.org/radiation\\_oncology](https://www.hopkinsmedicine.org/radiation_oncology) .

**[III] Radiation Oncology R&D Informatics Framework Involving Python Metaprogramming Using Z3Py+ImageAI :**



**[ Figure I – Algorithm I –( Z3Py/Theorem Prover+Python–IMAGEAI+Metaprogramming in Python ) → Next Generation Radiation Oncology Informatics Framework ]**

<https://au.mathworks.com/company/events/seminars/computational-methods-for-radiation-oncology-using-matlab-2807168.html>

[https://www.researchgate.net/publication/275084028\\_Informatics\\_in\\_Radiation\\_Oncology](https://www.researchgate.net/publication/275084028_Informatics_in_Radiation_Oncology) – Important Publications.

<https://www.kurzweilai.net/the-top-ai-breakthroughs-of-2015> – AI Stuff

**[ “Artificially Intelligent Computer Systems are hungry for data. As a result, they must be continuously fed with the right kind of data (standardized/structured) so they continuously learn and update their algorithms.**

[a] However, cancer diagnosis and treatment represents multiple types of often non-standardized data sets, collected across multiple disciplines. For example, computer systems still are not able to incorporate unstructured data such as the pathology data which forms the basis of initial diagnosis.

[b] In addition, incorporating machine learning tools to pull from larger and potentially multi-center patient protocols challenges patient healthcare information privacy boundaries.

[c] Also, as AI is incorporated into cancer treatment planning systems, the impact of automation on existing workforce skillsets must be evaluated. “

“Radiation oncology appears to be a provocative sandbox for incorporating artificially intelligent computer systems as a tool for cancer prognosis and treatment. The field is characterized by its wide variety and veracity of data types and consequential decision-making process on patients’ outcomes.”

“ Still, more broad-based adoption of artificially intelligent treatment planning systems in radiation oncology challenges the traditional roles of dosimetrists, medical physicists and physicians. “ ]

[ Source – <https://itbizadvisor.com/2017/07/radiation-oncology-ai-and-machine-learning-in-research/> ]

**[III] Related R&D Information (((via))) Vixra.org :**

[a] [www.vixra.org/author/nirmal\\_tej\\_kumar](http://www.vixra.org/author/nirmal_tej_kumar)

[b] <http://www.vixra.org/pdf/1803.0124v1.pdf>

[c] [www.vixra.org/author/n\\_t\\_kumar](http://www.vixra.org/author/n_t_kumar)

[d] [www.vixra.org/author/d\\_n\\_t\\_kumar](http://www.vixra.org/author/d_n_t_kumar)

[e] <https://www.semanticscholar.org/author/Nirmal-Tej-Kumar/12354503/suggest>

[f] <http://vixra.org/pdf/1709.0412v1.pdf> – Formalizing Image Processing Using HOL.

[g] <http://www.vixra.org/pdf/1909.0548v1.pdf>

**[IV] Acknowledgment/s :**

Special Thanks to all Who made this happen in my LIFE. Non-Profit R&D.

**[V] Reference/s :**

[a] <https://www.w3schools.in/python-tutorial/metaprogramming/>

[b] <https://developer.ibm.com/tutorials/ba-metaprogramming-python/>

[c] <https://github.com/OlafenwaMoses/ImageAI> – AI Library/Software in the Context of Python.

[d] <https://github.com/Z3Prover/z3> – Z3Python – Theorem Prover.

[e] <http://dabeaz.com/py3meta/Py3Meta.pdf>

[f] <https://rosettacode.org/wiki/Metaprogramming>

[g] <https://www.smartspate.com/the-metaprogramming-in-production-on-python-part-1/>

[h] <https://medium.com/@guoxing/brief-intro-to-metaprogramming-with-python-a278fc104b3b>

**[ THE END ]**