

# Relationship Identification & Prediction of Diseases Association Using Micro-RNA of Genomic Data

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Received: 12 Jan 2018 ▪ Revised: 17 March 2018 ▪ Accepted: 10 April 2018

**Abstract:** The current process of finding the relationship between the father and the son and also predicting the diseases that is yet to occur is quite inaccurate because it includes only the gene-id of the respected person. In order to handle or to make this system more accurate, we propose this system by using the chromosome structure of the person. This system takes the input of the chromosome structure of the son that has been partitioned from the father's chromosome structure. It initially preprocesses the image of the son using the collaborative filtering for making it look different from the input image to show the similarity between the father and the son. It then detects the edge of the structure after preprocessing it using the SOBEL edge detection algorithm. The SOBEL edge detection algorithm is that the gradient of the image is calculated for each pixel position in the image. After detecting the edges of those input images, matching process starts between the input image and the list of father chromosome images. Then the matched output appears. In order to predict the diseases which is yet to come in future for the son is represented graphically by dividing it into three colors, firstly green represents there is less possibility of the son getting the disease, secondly yellow represents there may be any chance of son getting the disease and finally red represents there is high possibility of son getting the disease.

**Keywords:** Image Processing, Edge Detection, Image Matching, Graphical Representation.

## INTRODUCTION

Data mining is the way toward finding designs in extensive informational collections including techniques at the crossing point of machine learning, insights, and database frameworks. It is a fundamental procedure where shrewd strategies are connected to remove information designs. It is an interdisciplinary subfield of software engineering. The general objective of the information mining process is to extricate data from an informational index and change it into a reasonable structure for further use. Other than the rough examination step, it incorporates database and data the officials' perspectives, data pre-handling, model and inference thoughts, captivating quality estimations, multifaceted nature considerations, post-planning of discovered structures, recognition, and web invigorating Information mining is the examination venture of the "learning revelation in databases" procedure or KDD.

Image processing is planning of pictures using numerical exercises by a flag getting ready for which the data is an image, a movement of pictures or a video, for instance, a photograph or a video layout; the yield of image pre-processing might be either a picture or a lot of qualities or parameters identified with the picture. Most picture preparing procedures include regarding the picture as a two-dimensional flag and applying standard flag handling methods to it. Pictures are additionally handled as three-dimensional signs with the third measurement being time or the z-hub.

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In recent years, the technology is being increased to greater level in several fields. This system focuses on the medical field. our system helps the doctors or the admins to predict the diseases easily with help of some tools and technologies.

In our system, we are going to find the relation of father and son using two of the factors. One is the gene id and the other is the chromosome structure. Nextly the diseases that the father has, can also occur for the son are being predicted. When dealing with gene id it was bought from the real time hospitals. Using the father's gene id, the son's gene id is bought by the way of molecular weight and the possibilities of the diseases for the son are displayed by using some of the algorithms. When dealing with chromosome structure, son's structure is given as input and the fathers structure is retrieved using the cM(Centimorgan) and SNP (Single- nucleotide Polymorphisms) values and the diseases are predicted and the disease severity is displayed in a graph. This project not only deals with human chromosome but little process on rat chromosome structure are also being included.

The performance is more accurate when dealing with chromosome structure than with gene id. It also becomes more realistic when dealing the chromosome. The understandability is also very easy with chromosomes. When dealing with gene id it speaks of molecular weight which is the back-end calculation. When with chromosome structure it gives the visual similarity which the user or the admin can easily view the relation between the father and the son. The gene id format differs from organization to organization but the structure is standard format for any type of chromosome.

### MICRO-RNA OF GENOMIC DATA

Quality articulation in cells and tissues of each mind boggling creature is definitely controlled and to a great extent subject to various conditions, (for example, improvement, changes in nature, illnesses or medications). Different cells and organ frameworks inside such life form (counting people) contain diverse quality articulation profiles, in this way legitimate comprehension of administrative systems engaged with such articulation speaks to one of the key issues in genomic medication.

Separating miRNAs from different classes of little RNAs that are available in the phone is frequently unwieldy – especially the qualification from endogenous little meddling RNAs (siRNAs). The most critical refinement among miRNAs and siRNAs is whether they quietness their very own appearance. Practically all siRNAs (paying little heed to their viral or other starting point) quiet a similar locus from which they were determined. Then again, most miRNAs don't quiet their very own loci, yet different qualities. miRNAs control assorted parts of improvement and physiology, hence understanding its organic job is demonstrating increasingly critical. Investigation of miRNA articulation may give profitable data, as dysregulation of its capacity can prompt human illnesses, for example, malignant growth, cardiovascular and metabolic infections, liver conditions and invulnerable brokenness.

### LITERATURE SURVEY

**Hailin chen and zuping zhang(2018):** In this paper, we proposed a miRNA-based computational strategy HNBI to induce novel medication ailment relationship for medication repositioning. Likeness estimations and tentatively bolstered affiliation data were first coordinated to develop a three-layer medicate miRNA-malady heterogeneous system.

Our technique at that point refreshed the quality of load between unlinked tranquilize miRNA, miRNA-sickness, and medication illness matches iteratively till settled. In light of data on the heterogeneous system, the last load of medication malady affiliations was gotten by outlining the estimations of ways associating the two kinds of hubs. We organized the potential medication sickness relationship as indicated by the new weight. At the point when connected to the gathered informational index for cross-approval tests, our strategy demonstrated predominant execution in medication ailment affiliation forecasts contrasted and two best in class strategies. Besides, our technique HNBI joined data of target miRNAs to comprehend the components of activity of medications and the atomic instruments of maladies. A contextual investigation on the medication Terazosin showed that some anticipated signs with high positions were upheld by the ongoing writing, which further delineated the down to earth handiness of our technique. At last, far reaching expectations of relationship among medications and ailments were discharged for future medication repositioning thinks about.

**Rohith Babu, I.Rakesh, Auxilia Osvin Nancy,(2018):** In this paper, we propose a novel strategy called SNCoNMF (Sparse Network regularized non-negative grid factorization for Co-administrative modules recognizable proof) which embraces various nonnegative lattice factorization structure to distinguish co-administrative modules including miRNAs, TFs and qualities.

This technique mutually coordinates miRNA, TF and quality articulation profiles, and extra priori systems were included a regularized way.

Also, to keep away from the sparsity of these systems, we utilize the sparsity punishments to the factors to accomplish secluded arrangements. The numerical definition can be adequately comprehended by an iterative multiplicative refreshing calculation.

We apply this technique to various genomic information including the articulation profiles of miRNAs, TFs and qualities on bosom malignant growth got from TCGA, priori miRNA-quality controls, TF-quality directions and quality connections. The outcomes demonstrate that the miRNAs, TFs and qualities of the co-administrative modules are essentially related and modules have a sensible size dissemination. Besides, the co-administrative modules are fundamentally advanced in GO organic procedures and KEGG pathways, individually.

**Z. Sun, Z. Wu, F. Zhang, Q. Guo, H. Chen, J. Zhao, D. Song, Q. Huang, L. Li, and J. Xiao,(2016):** Bosom disease is the most well-known reason for malignant growth demise in ladies and positions second among malignancy passings. Metastasis is the fundamental driver of death in bosom malignancy patients. In any case, the instruments hidden the intrusion and metastasis of bosom malignant growth cells remain to a great extent slippery.

Here we report that the protein 9 PRAME, a tumor-related antigen separated from a melanoma, assumes a job in keeping the expansion and metastasis of bosom disease cells. Thumping down of PRAME advances bosom malignant growth cell multiplication and hinders apoptosis. What's more, hindrance of PRAME advances the attack of bosom malignancy cells. To additionally inspect the job of PRAME in vivo, we used mouse model and found the volume and the heaviness of tumors was uniquely expanded after PRAME was thumped down. This investigation exhibits that PRAME capacities as a tumor silencer in bosom disease.

**M. E. Ritchie, B. Phipson, D. Wu, Y. Hu, C. W. Law, W. Shi, and G. K. Smyth,(2015):** Limma is a R/Bioconductor programming bundle that gives a coordinated answer for examining information from quality articulation tests. It contains rich highlights for dealing with complex trial structures and for data acquiring to beat the issue of little example sizes. Over the previous decade, limma has been a well known decision for quality revelation through differential articulation investigations of microarray and high-throughput PCR information. The bundle contains especially solid offices for perusing, normalizing and investigating such 14 information. As of late, the capacities of limma have been altogether extended in two critical ways.

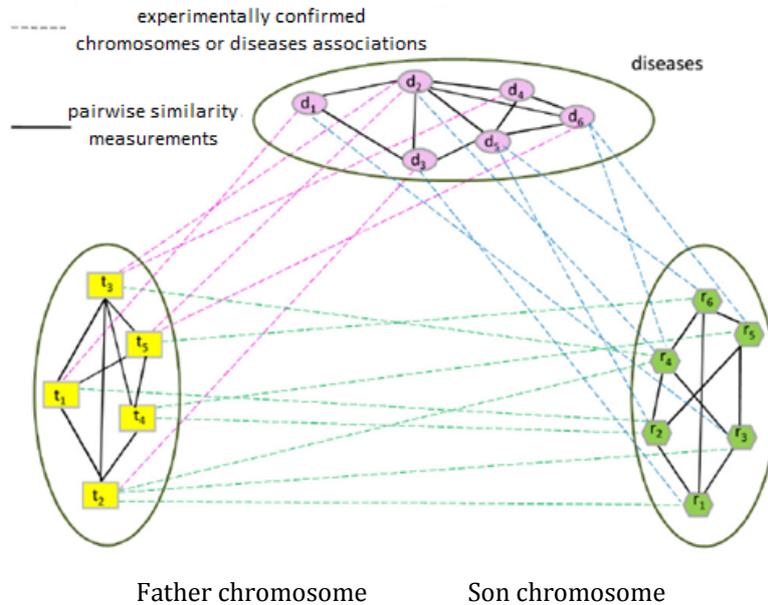
In the first place, the bundle would now be able to perform both differential articulation and differential joining investigations of RNA sequencing (RNA-seq) information. All the downstream investigation apparatuses recently limited to microarray information are presently accessible for RNA-seq too.

These capacities enable clients to break down both RNA-seq and microarray information with fundamentally the same as pipelines. Second, the bundle is presently ready to go past the customary quality savvy articulation investigations in an assortment of ways, breaking down articulation profiles as far as co-managed sets of qualities or as far as higher-request articulation marks. This gives upgraded potential outcomes to natural elucidation of quality articulation contrasts. This article audits the logic and plan of the limma bundle, abridging both new and recorded highlights, with an accentuation on late improvements and highlights that have not been recently depicted.

**Samta Gupta, Susmita Ghosh Mazumdar(2013):** Edge recognition is in the front line of picture handling for article location, it is urgent to have a decent comprehension of edge identification calculations. Sobel which is a well known edge discovery calculation is considered in this work. There exists a capacity, edge's which is in the picture tool kit. In the edge work, the Sobel technique utilizes the subordinate guess to discover edges.

Hence, it returns edges at those focuses where the inclination of the considered picture is most extreme. The Sobel administrator plays out a 2-D spatial slope estimation on pictures. It utilizes a couple of level and vertical inclination lattices whose measurements are 3×3 for edge identification activities. It will likewise show how to assemble a Sobel indicator capacity of 5 ×5 measurement in tangle lab to discover edges.

## OVERALL ARCHITECTURE

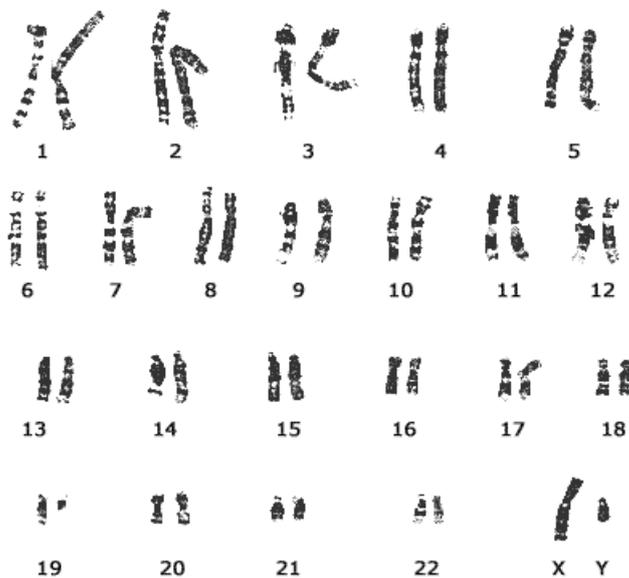


## METHODOLOGY

### DATASET

The picture chromosomes of dataset have been made for examination of ailment. This dataset contains twenty two cases and five characteristics are utilized in this similar examination. The chromosome legacy and how to examining chromosomes by utilizing GEDmatch databases to discover One-to-numerous Matches, One-to-one Compare, and People who coordinate either of two kits, the ideas are relevant to comparative databases given by the DNA real testing administrations. This implies your DNA information is in the GEDmatch database so it very well may be utilized to contrast with others. Here the backend of the coding utilizing by java stage. Java is a comprehensively valuable PC programming language that is synchronous, class-based, object-arranged, and unequivocally planned to have as few execution conditions as could sensibly be normal. It is planned to give application designers "a chance to write once, run anyplace", implying that accumulated Java code can keep running on all stages that help Java without the requirement for recompilation.

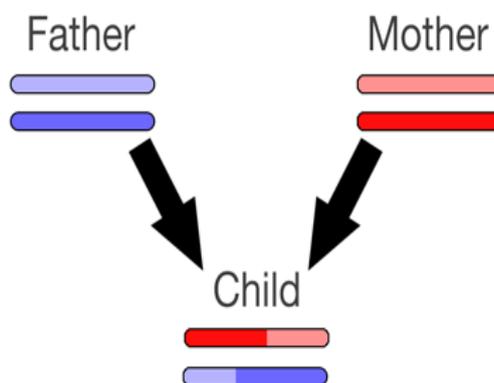
### 1) Chromosome Basics



Chromosomes are small structures found inside your cells. They contain the DNA data and guidelines that characterize your identity - what you resemble, how your body works, and even what hereditary ailments you may have. People have 46 chromosomes. Be that as it may, chromosomes come in sets, so we ordinarily consider them 23 sets of chromosomes. The initial 22 chromosome sets (called autosomes) are numbered 1 through 22. We'll basically concentrate on these autosomal chromosomes.

## 2) Chromosome Inheritance

One autosomal chromosome from each pair originates from your mom and alternate originates from your dad. This implies you get half of your DNA from your mom and half from your dad. Every chromosome they pass on to you is their very own blend pair of chromosomes which they got from their folks (your grandparents).



The picture above delineates how one sets of chromosomes might be passed from your folks to you. The hues don't mean anything unique - they basically portray the individual chromosomes and chromosome areas

## Image Preprocessing

Image processing is a method to perform in the use of computer algorithm to create, processing and convert signals from an image sensor in to digital image. Image processing toolbox provide a comprehensive to the set of reference in a standard algorithm work flow in a image processing to visualize perform in a image segmentation.

## Edge Detection

Edge detection is an image processing technique for finding the boundary of object within the image. It works by discontinuities in brightness. Edge detection is used for image detection data extraction in area such as image processing, computer version and machine version.

## Image Matching

Image matching is used to match the similar images from the multiple set of images with respect to the input image .It is done by a comparing the input image with the set of images and the finally produce a similar image as output. Here we have used modified greedy algorithm to match the same chromosome structure image based on some similarity between two images.

## Graphical Representation

Here we have shown the list of predicted diseases and their possibility of occurring with respect to son and is represented graphically by dividing it into three colors, firstly green represents there is less possibility of the son getting the disease, secondly yellow represents there may be any chance of son getting the disease and finally red represents there is high possibility of son getting the disease.

## Collaborative Filtering Algorithm

For every client, recommender frameworks prescribe things dependent on how comparable clients loved the thing. Suppose Alice and Bob have comparable interests in computer games. Alice as of late played and delighted in the amusement Legend of Zelda: Breathe of the Wild. Sway has not played this amusement, but since the framework has discovered that Alice and Bob have comparative tastes, it prescribes this diversion to Bob. Notwithstanding client likeness, recommender frameworks can likewise perform synergistic sifting utilizing thing comparability ("Users who preferred this thing additionally loved X").

### Sobel Edge Detection Algorithm

Edge recognition is in the cutting edge of picture handling for item identification, it is significant to have a decent comprehension of edge location calculations. Sobel which is a prevalent edge location calculation is considered in this work.

There exists a capacity, `edge.m` which is in the picture tool kit. In the edge work, the Sobel strategy utilizes the subsidiary guess to discover edges. In this manner, it returns edges at those focuses where the inclination of the considered picture is most extreme. The Sobel administrator plays out a 2-D spatial inclination estimation on pictures. It utilizes a couple of level and vertical angle grids whose measurements are  $3 \times 3$  for edge identification activities. It will likewise exhibit how to assemble a Sobel finder capacity of  $5 \times 5$  measurement in matlab to discover edges.

### Modified Greedy Algorithm

An altered eager calculation called Multi-Tree-based Orthogonal Matching Pursuit (MTOMP). It is an algorithmic worldview that pursues the critical thinking heuristic of settling on the locally ideal decision at each phase with the goal of finding a worldwide ideal.

In numerous issues, an eager technique does not for the most part produce an ideal arrangement, yet in any case an avaricious heuristic may yield locally ideal arrangements that surmised a universally ideal arrangement in a sensible measure of time.

## EXPERIMENTAL RESULT

In this system a collaborative filtering is used for preprocessing method. In the preprocessing the required information that are related to the chromosome and diseases are processed. We use edge detection method to detect the edges of the chromosome structure and so that it gets the parent chromosome.

For the edge detection we use the algorithm called Sobel Edge detection. This algorithm is being used because it gives the exact outer structure when compared to that of other algorithms. Then for matching purpose the Modifies Greedy algorithm is being used to match the related chromosome. Then the bar graph is being generated.

From the bar graph the possibility or the chances of the diseases for the son are displayed with the percentage of diseases. The chances are also being displayed with the color differences. Then finally the histogram can be displayed for each of the input structure that is being given. Thus, by using these predictions and the bar graph, the admins and the doctors can be benefited for explaining or show casing the patients or the users to understanding an easy way.

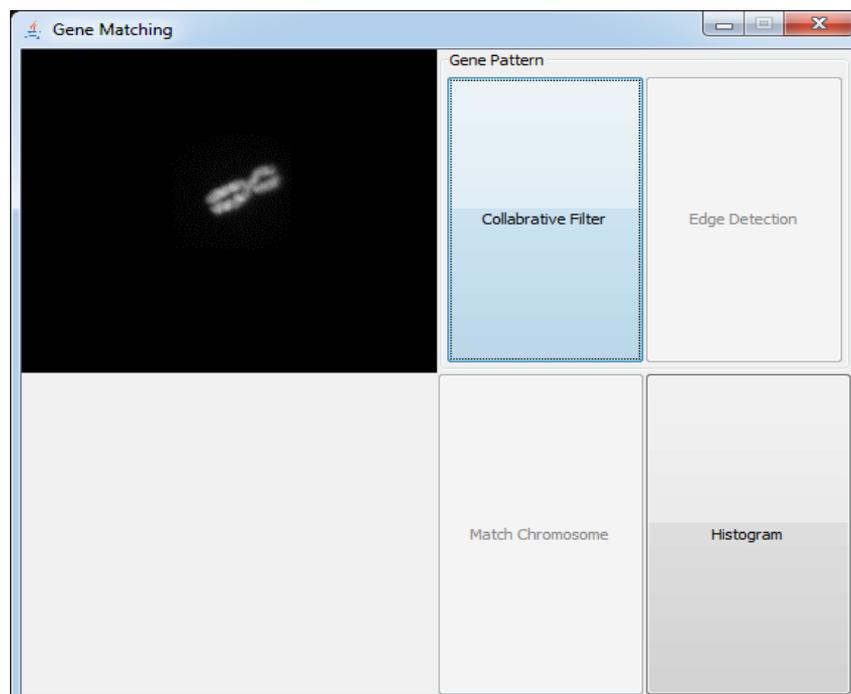


Fig. 6.1: Image preprocessing

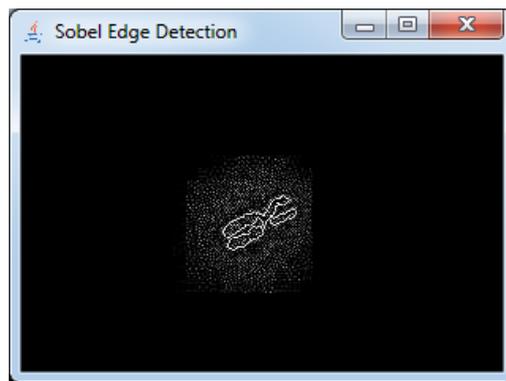
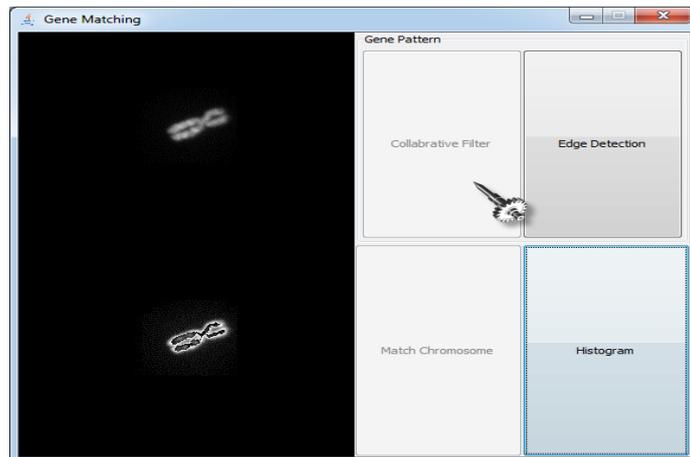


Fig. 6.2: Edge Detection



Fig. 6.3: Image Matching

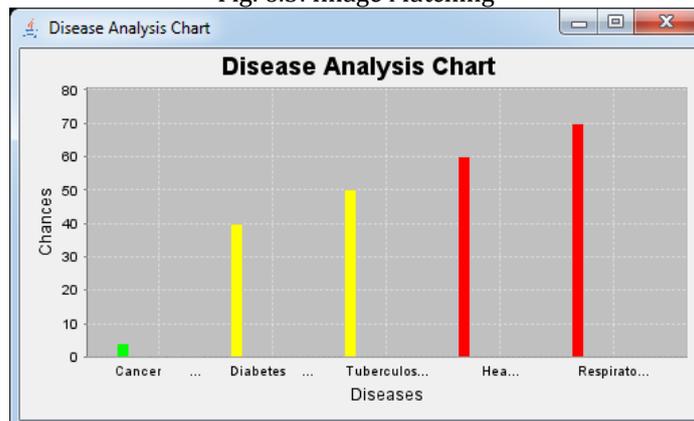


Fig. 6.4: Graphical Representation

## CONCLUSION

In this system a collaborative filtering is used for preprocessing method. In the preprocessing the required information that are related to the chromosome and diseases are processed. We use edge detection method to detect the edges of the chromosome structure and so that it gets the parent chromosome. For the edge detection we use the algorithm called Sobel Edge detection. This algorithm is being used because it gives the exact outer structure when compared to that of other algorithms. Then for matching purpose the Modified Greedy algorithm is being used to match the related chromosome. Then the bar graph is being generated. From the bar graph the possibility or the chances of the diseases for the son are displayed with the percentage of diseases. The chances are also being displayed with the color differences. Then finally the histogram can be displayed for each of the input structure that is being given.

## REFERENCES

- [1] Udayakumar, R., Khanaa, V., & Saravanan, T. (2013). Analysis of polarization mode dispersion in fibers and its mitigation using an optical compensation technique. *Indian Journal of Science and Technology*, 6(6), 4767-4771.
- [2] Udayakumar, R., Kumaravel, A., & Rangarajan, K. (2013). Introducing an efficient programming paradigm for object-oriented distributed systems. *Indian Journal of Science and Technology*, 6(5S), 4596-4603.
- [3] Mageswaran, S.U., & Sekhar, N.G. (2013). Reactive power contribution of multiple STATCOM using particle swarm optimization. *International Journal of Engineering & Technology*, 5(1), 122-126.
- [4] Giri, R.K., & Saikia, M. (2013). Multipath routing for admission control and load balancing in wireless mesh networks. *International Review on Computers and Software*, 8(3), 779-785.
- [5] Padmapriya, G., Manikandan, A., Krishnasamy, V., Jaganathan, S.K., & Antony, S.A. (2016). Spinel  $\text{Ni}_x\text{Zn}_{1-x}\text{Fe}_2\text{O}_4$  ( $0.0 \leq x \leq 1.0$ ) nano-photocatalysts: synthesis, characterization and photocatalytic degradation of methylene blue dye. *Journal of Molecular Structure*, 1119, 39-47.
- [6] Vijayaragavan, S.P., Karthik, B., Kiran Kumar, T.V.U., & Sundar Raj, M. (2013). Analysis of chaotic DC-DC converter using wavelet transform. *Middle-East Journal of Scientific Research*, 16(12), 1813-1819.
- [7] Lokesh, K., Kavitha, G., Manikandan, E., Mani, G.K., Kaviyarasu, K., Rayappan, J.B.B., ... & Maaza, M. (2016). Effective ammonia detection using n-ZnO/p-NiO heterostructured nanofibers. *IEEE Sensors Journal*, 16(8), 2477-2483.
- [8] Abraham, A.G., Manikandan, A., Manikandan, E., Vadivel, S., Jaganathan, S.K., Baykal, A., & Renganathan, P.S. (2018). Enhanced magneto-optical and photo-catalytic properties of transition metal cobalt ( $\text{Co}^{2+}$  ions) doped spinel  $\text{MgFe}_2\text{O}_4$  ferrite nanocomposites. *Journal of Magnetism and Magnetic Materials*, 452, 380-388.
- [9] Kennedy, J., Fang, F., Futter, J., Leveneur, J., Murmu, P.P., Panin, G.N., & Manikandan, E. (2017). Synthesis and enhanced field emission of zinc oxide incorporated carbon nanotubes. *Diamond and Related Materials*, 71, 79-84.
- [10] Teresita, V.M., Manikandan, A., Josephine, B.A., Sujatha, S., & Antony, S.A. (2016). Electromagnetic properties and humidity-sensing studies of magnetically recoverable  $\text{LaMg}_x\text{Fe}_{1-x}\text{O}_{3-\delta}$  perovskites nano-photocatalysts by sol-gel route. *Journal of Superconductivity and Novel Magnetism*, 29(6), 1691-1701.
- [11] Caroline, M.L., & Vasudevan, S. (2009). Growth and characterization of pure and doped bis thiourea zinc acetate: Semiorganic nonlinear optical single crystals. *Current applied physics*, 9(5), 1054-1061.
- [12] Jayalakshmi, V., & Gunasekar, N.O. (2013). Implementation of discrete PWM control scheme on Dynamic Voltage Restorer for the mitigation of voltage sag/swell. *International Conference on Energy Efficient Technologies for Sustainability*, 1036-1040.
- [13] Udayakumar, R., Khanaa, V., & Kaliyamurthie, K.P. (2013). Optical ring architecture performance evaluation using ordinary receiver. *Indian Journal of Science and Technology*, 6(6), 4742-4747.
- [14] Udayakumar, R., Khanaa, V., & Kaliyamurthie, K.P. (2013). Performance analysis of resilient fth architecture with protection mechanism. *Indian Journal of Science and Technology*, 6(6), 4737-4741.

- [15] Saravanan, T., Srinivasan, V., & Sandiya, V.P. (2013). A two stage DC-DC converter with isolation for renewable energy applications. *Indian Journal of Science and Technology*, 6(6), 4824-4830.
- [16] Sundarraj, M. (2013). Study of compact ventilator. *Middle-East Journal of Scientific Research*, 16(12), 1741-1743.
- [17] Thema, F.T., Manikandan, E., Gurib-Fakim, A., & Maaza, M. (2016). Single phase Bunsenite NiO nanoparticles green synthesis by *Agathosma betulina* natural extract. *Journal of alloys and compounds*, 657, 655-661.
- [18] Sathyaseelan, B., Manikandan, E., Sivakumar, K., Kennedy, J., & Maaza, M. (2015). Enhanced visible photoluminescent and structural properties of ZnO/KIT-6 nanoporous materials for white light emitting diode (w-LED) application. *Journal of Alloys and Compounds*, 651, 479-482.
- [19] Gopalakrishnan, K., Prem Jeya Kumar, M., Sundeep Aanand, J., & Udayakumar, R. (2013). Analysis of static and dynamic load on hydrostatic bearing with variable viscosity and pressure. *Indian Journal of Science and Technology*, 6(6), 4783-4788.
- [20] Prabhu, M.R., Reji, V., & Sivabalan, A. (2012). Improved radiation and bandwidth of triangular and star patch antenna. *Research Journal of Applied Sciences, Engineering and Technology*, 4(12), 1740-1747.
- [21] Arumugam, S. and Ramareddy, S. (2012). Simulation comparison of class D/ Class E inverter fed induction heating. *Journal of Electrical Engineering*, 12(2), 71-76.
- [22] Udayakumar, R., Khanaa, V., & Kaliyamurthie, K.P. (2013). High data rate for coherent optical wired communication using DSP. *Indian Journal of Science and Technology*, 6(6), 4772-4776.
- [23] Nagarajan, C., & Madheswaran, M. (2012). Experimental Study and Steady State Stability Analysis of CLL-T Series Parallel Resonant Converter with Fuzzy Controller using State Space Analysis. *Iranian Journal of Electrical and Electronic Engineering*, 8(3): 259-267.
- [24] Gopalakrishnan, K., PremJeya Kumar, M., SundeepAanand, J., & Udayakumar, R. (2013). Thermal properties of doped azopolyester and its application. *Indian Journal of Science and Technology*, 6(6), 4722-4725.
- [25] Kumaravel A., Meetei O.N. (2013). An application of non-uniform cellular automata for efficient cryptography. *Indian Journal of Science and Technology*, 6(5): 4560-4566.
- [26] Kumaravel, A., & Pradeepa, R. (2013). Layered approach for predicting protein subcellular localization in yeast microarray data. *Indian Journal of Science and Technology*, 6(5S), 4567-4571.
- [27] Kaviyarasu, K., Manikandan, E., Kennedy, J., & Maaza, M. (2016). Synthesis and analytical applications of photoluminescent carbon nanosheet by exfoliation of graphite oxide without purification. *Journal of Materials Science: Materials in Electronics*, 27(12), 13080-13085.
- [28] Mathubala, G., Manikandan, A., Antony, S.A., & Ramar, P. (2016). Photocatalytic degradation of methylene blue dye and magneto-optical studies of magnetically recyclable spinel  $\text{Ni}_x\text{Mn}_{1-x}\text{Fe}_2\text{O}_4$  ( $x= 0.0-1.0$ ) nanoparticles. *Journal of Molecular Structure*, 1113, 79-87.
- [29] Manikandan, E., Kennedy, J., Kavitha, G., Kaviyarasu, K., Maaza, M., Panigrahi, B.K., & Mudali, U.K. (2015). Hybrid nanostructured thin-films by PLD for enhanced field emission performance for radiation micro-nano dosimetry applications. *Journal of Alloys and Compounds*, 647, 141-145.
- [30] Kumaravel, A., & Meetei, O.N. (2013). An application of non-uniform cellular automata for efficient cryptography. *IEEE Conference on Information & Communication Technologies*: 1200-1205.
- [31] Langeswaran, K., Gowthamkumar, S., Vijayaprakash, S., Revathy, R., & Balasubramanian, M.P. (2013). Influence of limonin on Wnt signalling molecule in HepG2 cell lines. *Journal of natural science, biology, and medicine*, 4(1), 126-133.
- [32] Srinivasan, V., & Saravanan, T. (2013). Analysis of harmonic at educational division using CA 8332. *Middle-East Journal of Scientific Research*, 16(12), 1768-73.
- [33] Josephine, B.A., Manikandan, A., Teresita, V.M., & Antony, S A. (2016). Fundamental study of  $\text{LaMg}_x\text{Cr}_{1-x}\text{O}_{3-\delta}$  perovskites nano-photocatalysts: sol-gel synthesis, characterization and humidity sensing. *Korean Journal of Chemical Engineering*, 33(5), 1590-1598.
- [34] Saravanan, T., Saritha, G., & Udayakumar, R. (2013). Robust H-Infinity Two Degree of Freedom Control for Electro Magnetic Suspension System. *Middle-East Journal of Scientific Research*, 18(12), 1827-1831.

- [35] Rajasulochana, P., Dhamotharan, R., Murugakoothan, P., Murugesan, S., & Krishnamoorthy, P. (2010). Biosynthesis and characterization of gold nanoparticles using the alga *Kappaphycus alvarezii*. *International Journal of Nanoscience*, 9(05), 511-516.
- [36] Slimani, Y., Güngüneş, H., Nawaz, M., Manikandan, A., El Sayed, H. S., Almessiere, M. A., & Baykal, A. (2018). Magneto-optical and microstructural properties of spinel cubic copper ferrites with Li-Al co-substitution. *Ceramics International*, 44(12), 14242-14250.
- [37] Kaviyarasu, K., Manikandan, E., Kennedy, J., Jayachandran, M., & Maaza, M. (2016). Rice husks as a sustainable source of high quality nanostructured silica for high performance Li-ion battery requital by sol-gel method—a review. *Adv. Mater. Lett*, 7(9), 684-696.
- [38] Ilayaraja, K., & Ambica, A. (2015). Spatial distribution of groundwater quality between injambakkamthiruvanmyiur areas, south east coast of India. *Nature Environment and Pollution Technology*, 14(4), 771-776, 2015.
- [39] Sharmila, S., Rebecca, L. J., Das, M.P., & Saduzzaman, M. (2012). Isolation and partial purification of protease from plant leaves. *Journal of Chemical and Pharmaceutical Research*, 4(8), 3808-3812.
- [40] Rajakumari, S.B., & Nalini, C. (2014). An efficient cost model for data storage with horizontal layout in the cloud. *Indian Journal of Science and Technology*, 7(3), 45-46.
- [41] Elizabeth, T.P., Dev, P.K., & Kavitha, S. (2014). An Efficient Data Gathering Mechanism using M\_Collectors. *The SIJ Transactions on Computer Networks & Communication Engineering (CNCE)*, 2(1), 5-9.
- [42] RaveenaSowmya, N. (2019). Grid Connected Wind Energy System with Maximum Power Point Tracking Technique. *Journal of Computational Information Systems*, 15(1), 131-135.
- [43] Modupalli, M. (2019). PV- based Grid Connected System by Z-Source Inverter. *Journal of Computational Information Systems*, 15(1), 136-142.
- [44] Rojapriyadharshini, A., and Dr.Kalaiselvi, S.(2017). Efficient and Enhanced Attribute-based Encryption for Cloud Computing. *Excel International Journal of Technology, Engineering and Management*, 4(1), 46-48.
- [45] Dhivyabharathi, A., and Dr.Kalaiselvi, S.(2017). Improved Network Intrusion Detection and Prevention. *Excel International Journal of Technology, Engineering and Management*, 4(1), 49-51.
- [46] Gireesha, B. (2019). MATLAB/Simulink Based Design and Simulation of Square Patch Microstrip Antenna. *Journal of Computational Information Systems*, 15(1), 143-149.
- [47] HemaSree, P. (2019). Performance of different Feature descriptors for Recognizing Blurred Faces using Adaptive Sparse Regularization Restoration with LCDRC. *Journal of Computational Information Systems*, 15(1), 150-161.
- [48] Prasanth Kumar, K., & Mohan, J. (2015). Design of Control Circuit for 8/6 Switched Reluctance Motor. *International Journal of Advances in Engineering and Emerging Technology*, 7(6), 316-328.
- [49] Lalitha, N., & Ganesan, S. (2015). Fuzzy Controlled Fault Tolerant Converter for Wind Turbine Application. *International Journal of Advances in Engineering and Emerging Technology*, 7(6), 329-341.
- [50] Sindhuja Sankareshwari, C., & Sujith Kumar, S. (2015). Active Power Filter Performance at Distribution Level with Power Quality Improvement. *International Journal of Advances in Engineering and Emerging Technology*, 7(6), 367-376.