



Recent trends in Management and Commerce

Vol: 1(2), 2020

REST Publisher

ISBN: 978-81-936097-6-7

Website: <http://restpublisher.com/book-series/rmc/>



Theory and Its Applications to Large-Scale Industrial Engineering Problems of Industrial Engineering Education

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Abstract

Industrial engineering is manufacturing and service Design, analysis of operations and systems, and related to control. Past At the time, an industrial engineer was in a manufacturing plant Working and workers and machines Engaged in functional capacity. Industrial Engineers To eliminate waste in production processes Find ways. a product or service Labor, machinery, materials, information to supply, and efficient systems for integrating energy They create. Industry Engineering every year countless international attracts students. It's great engineering and Committed to business. It is provides undergraduate students with key concepts in the design, planning and optimization of manufacturing and production processes. That is the basis of a Bachelor of Industrial Engineering degree. Petroleum engineer tops our list of highest paying engineering jobs. The primary responsibility of petroleum engineers is to design and develop ways to extract the natural resources of oil and gas from the earth. Elon Musk is a South African-born American who is an Industrial Engineer with Paypal Co-founded and Space Transportation Service He founded the company Space X. He is an electric car Among the early investors in the company Tesla Was and is one company's CEO. SPSS statistics is a SOA, SHO, GWO, PSO, MVO, SCA, GSA, GA, DE. The Cronbach's Alpha Reliability The overall Cronbach's Alpha value for the model is 0.991 which Indicates 70 % reliability. From the literature review, the above 80 % Cronbach's Alpha value model can be considered for analysis.

Keyword: SPSS Statistics, SOA, PSO, SCA, MVO, SCA.

Introduction

Middle East Technical University (METU) A To improve the quality of Industrial Engineering (IE) education Quality Function Deployment (QFD) approach is provided. The main stakeholders in IE education are students, the Future of faculty members, and students identified as employers. [1] Performance SOA Algorithm Seven in real life, for comparison In solving constrained optimization problems Algorithms. Many of these problems are equivocal Inclusion and inequality constraints contain This SOA algorithm is a constraint to optimize problems- Must have a handling system. [2] The United States remains The most productive and influential country in the CIE, its Influence has waned over time, and today China CIE More at the University of Central Florida annually Publishing documents University of Florida Most effective, however, is Ashikaga Institute of Technology is very influential is a company. [3] Located within the College of Engineering, the Pennsylvania State University is a partOur focus is on supporting talented and talented teachers to use technology to enhance teaching and learning. We arePartner with teachers to improve teaching practice and student learning outcomes. [5] Proposed STOA algorithm Performance is another sophistication Compared to six constrained algorithms that should be investigated in solving optimization problems. Many of the issues are equality and inequality has restrictions. To improve these problems, The STOA algorithm is a control-handling method to have [6] Successful use of an enzyme as an industrial biochem For implementation, under the required operating conditions of operational efficiency and cost-effectiveness Basically improved functionality, uniqueness and economical and suitable with stability Requires presence of the enzyme. Multiple protein engineering to provide Strategies are developed tailors [7] In the area of industrial robots, there are two main ones One can distinguish between the problems: (i) Robot Welding, painting, or laser and plasma cutting Robots operating in, and (ii) robots Doing compatible tasks. , metal surfaces Assembling, finishing and polishing, etc. A robotic manipulator in an independent environment during operation, kinematics and kinematic analysis Instructions for designing a control provides frame, [8] two to execute the engineering practice at the same time Basic approaches may include: Team-based and computerized-based approaches. Group work approach humanistic; it is the designers and Other relevant persons in functional areas Includes. The committee members have been selected them [9] HKES Forward Engineering System (FKES) and backward Engineering Organization (BKES) and two subs Contain settings. Generally, product substitutes FKES is used to develop and new product BKES is used to predict ARs of designs. [10] A for supply chain management Holistic approach encompasses multiple dimensions to the approach and is Capable of solving industrial scale problems A general optimization framework is required. Supply chain planning, scaling, and design A decision-support framework for problems are economic, For environmental and responsive performance Clear trade-offs between clarifies. [11] Product categories are

incremental and life cycles When downsizing, the product maintains competitiveness Increasing need to reduce development time is coming marketplace. Therefore, In technology to reduce Product development time will increase Revolutionary improvements rather than changes required [12] The industrial robot needs to avoid certain obstacles For some pick-n-place operations. Load Capacity (LC), Maximum Tip Speed (MTS), Repeatability (RE), Memory Capacity (MC), and Handling accessibility (MR) including load capacity Five different robot selection characteristics. is considered as the maximum node. Speed, memory Ability, and access to handling are beneficial properties, [13] the methodology is by panel or panel consensus Relative weight for each quality attribute provided, which again is Subjective in nature, hence relative weighting Varies from company to company. It is OEC that brings some risk to calculations, therefore To deal with multiple response problems in industrial tests is Not widely accepted. [14] And the The degree of influence of an engineering characteristic (EC) on other ECs Reflects the importance of ECS. Those influences are ignored or in their importance using a linear combination determinant is mentioned. Conventional importance of ECs It assumes meaning effects that ECs have on other ECs. [15]

Materials and methods

SOA

The way internal systems are structured and the internal and The way external systems interact SOA promises to fundamentally transform This Architectural strategy is closer to commercial products and Goes hand in hand with software applications, this is an SOA that is stable and constant for inserting dynamic structure. relevant software. [1]. Due to the complex precursor chemistry, the biocatalyst A direct measure Anthropological contribution to SOA Impossible in tests. Biogenic SOA 3- with advanced methods of creation Quantification with dimensional photochemical air quality sampling Estimates are possible. Such samples are laboratory and Integrate findings from field studies and their Understand the relative impact [2] Web services standards and technologies Using SOA mainly for business information systems used and for enterprise information systems are fast becoming a standard approach. Supply Industry such as chain management order entry SOA has been successfully applied to organizations systems.[3]

PSO

Each particle in PSO is its own and it's own Dynamic according to the companion's historical behavior Flies through the search space at an adjusted speed. Recently, many about BSO policies or applications Particle swarm optimization is powerful for such research reported, [4] In more recent work, Toscano and Coello Clustering is the number of particle Techniques that were adopted to divide into clusters. Every In the subset, a PSO algorithm is implemented, And at one point, different subsets of information Interchange: Heads of each group change the exam pressure and Migrate to different swarms. [5]The test setup and selection variations of PSO Specific algorithm components and their Performance attributed to interactions Allow the identification of differences, therefore, PSO Contributes to an improved understanding of the approach. [6]

MVO

It obtains All the advantages of the SI optimization algorithm, better Upgrade capabilities, more search capability and less There are tuning parameters. As proposed by the MVO, Welding Beam Design, Gear Train Design, Pressure Ship design, and cantilever Classic engineering problems like beam design were Solved successfully [7]. The MVO algorithm measures the growth of individual populations It depends. Every person finds it a promising solution Consider. Information on several possible solutions Shares and focus on promising areas Communicate with each other to go. Best solution is, [8] MVO is inspired by a new meta-heuristic optimizer to find White holes, black holes, and physics Based on multiversity theory solutions for phenomena The best planet in the universe worm holes. [9]

SCA

It is inevitable that The SCA algorithm identifies promising regions of the search space When it comes to detection, the fitness of some search agents Worsens during the study phase. However, it shows fitness of the search agent has a descending behavior during iterations.[10]External to CT or MR-derived quantitative measurements Aortic diameter should be reported. It is important Because the size of the lumen is external to the intraluminal and Does not accurately reflect the thrombus, its diameter aorta in the aortic wall structure.Inflammation, [11]To overcome these weaknesses and its search capability To maximize, gray wolf optimizer and sine cosine Basically a new hybrid variant An algorithm is proposed to solve Proposed The hybrid variant is called HGWOSCA [12]

GSA

Hence, GSA's presence in school climate issues High impact ie safety in school or affected, while in GSA Being a member is like personal empowerment of a person- has a greater impact on specific outcomes. Education achievement In [13]. Bayesian framework, this is linked to how errors in the observations and model structure are represented by the statistical model. However, such a distinction is not relevant as far as the application of GSA is concerned, which is consistent with any definition of probability measurement. [14] On the other hand, there are many factors to consider Classification is a complex problem, and Because of this, there are various classification techniques in the literature are proposed. By the GSA algorithm Improved multiple classification problems are described. Two clauses are considered for purpose, original GSA and GSA's Transformations and classification problems hybrids. [15]

GA

On the other hand, there are many factors to consider Classification is a complex problem, and Because of this, there are various classification techniques in the literature are proposed. By the GSA algorithm Improved multiple classification problems are described. Two clauses are considered for purpose, original GSA and GSA's Transformations and classification

problems [16] However, very few gases present in seed plants are active growth regulators, and Most are biosynthetic intermediates or Biocatalysts that are catabolites of GAs. Wild type and of GA content in mutant plants analysis and treatment with GASmodulated various developmental processes in seed plants. [17] GAs use to develop new and innovative search strategies for of eligible and mixed population Survival of the Idea. Solutions a specific problem the number of strings represented is by GA maintained. closer to an optimal solution to the problem at hand. [18]

Result and Discussion

TABLE 1. Statistics Frequency

Frequency Statistics										
		SOA	SHO	GWO	PSO	MVO	SCA	GSA	GA	DE
N	Valid	5	5	5	5	5	5	5	5	5
	Missing	0	0	0	0	0	0	0	0	0
Mean		1.22E+03	1.23E+03	1.23E+03	1.23E+03	1.24E+03	1.27E+03	2.35E+03	1.23E+03	1.36E+03
Std. Error of Mean		1.16E+03	1.17E+03	1.17E+03	1.17E+03	1.19E+03	1.22E+03	2.30E+03	1.17E+03	1.30E+03
Median		4.03E+01	4.03E+01	4.03E+01	4.03E+01	4.38E+01	4.17E+01	4.93E+01	4.05E+01	4.45E+01
Mode		.3832a	.3849a	.3847a	.3847a	.4186a	.4179a	.9496a	.3995a	.9066a
Std. Deviation		2.60E+03	2.61E+03	2.61E+03	2.61E+03	2.67E+03	2.72E+03	5.14E+03	2.61E+03	2.90E+03
Variance		6.78E+06	6.79E+06	6.80E+06	6.81E+06	7.11E+06	7.40E+06	2.64E+07	6.81E+06	8.44E+06
Skewness		2.231	2.231	2.231	2.231	2.233	2.232	2.235	2.231	2.233
Std. Error of Skewness		0.913	0.913	0.913	0.913	0.913	0.913	0.913	0.913	0.913
Kurtosis		4.98	4.98	4.98	4.98	4.988	4.985	4.996	4.98	4.987
Std. Error of Kurtosis		2	2	2	2	2	2	2	2	2
Range		5.88E+03	5.89E+03	5.89E+03	5.89E+03	6.01E+03	6.14E+03	1.15E+04	5.89E+03	6.55E+03
Minimum		0.3832	0.3849	0.3847	0.3847	0.4186	0.4179	0.9496	0.3995	0.9066
Maximum		5.88E+03	5.89E+03	5.89E+03	5.89E+03	6.01E+03	6.14E+03	1.16E+04	5.89E+03	6.55E+03
Sum		6.12E+03	6.13E+03	6.13E+03	6.13E+03	6.21E+03	6.36E+03	1.18E+04	6.13E+03	6.78E+03
Percentiles	10	0.383247	0.384889	0.38466	0.384683	0.418564	0.417932	0.949614	0.39954	0.906579
	20	0.462214	0.463553	0.463535	0.463539	0.503995	0.497861	0.976851	0.470104	0.945168
	30	0.699113	0.699546	0.70016	0.700105	0.760288	0.737648	1.06E+00	0.681798	1.06E+00
	40	1.66E+01	1.66E+01	1.66E+01	1.66E+01	1.80E+01	1.72E+01	2.04E+01	1.66E+01	1.84E+01
	50	4.03E+01	4.03E+01	4.03E+01	4.03E+01	4.38E+01	4.17E+01	4.93E+01	4.05E+01	4.45E+01
	60	1.36E+02	1.36E+02	1.36E+02	1.36E+02	1.11E+02	1.27E+02	1.21E+02	1.35E+02	1.26E+02
	70	1.34E+03	1.34E+03	1.34E+03	1.34E+03	1.33E+03	1.37E+03	2.45E+03	1.34E+03	1.45E+03
	80	4.74E+03	4.75E+03	4.75E+03	4.75E+03	4.84E+03	4.95E+03	9.27E+03	4.75E+03	5.28E+03
	90	5.88E+03	5.89E+03	5.89E+03	5.89E+03	6.01E+03	6.14E+03	1.16E+04	5.89E+03	6.55E+03

Table 1 shows the statistics values for analysis N, range, minimum, maximum, mean, standard deviation, Skewness Mode, Kurtosis, Percentiles, Sum, Std. Error of Kurtosis. SOA, SHO, GWO, PSO, MVO, SCA, GSA,GA,DE.

TABLE 2. Descriptive Statistics

Descriptive Statistics												
	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance	Skewness	Kurtosis			
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
SOA	5	5.88E+03	0.3832	5.88E+03	1.22E+03	1.16E+03	2.60E+03	6.78E+06	2.231	0.913	4.98	2
SHO	5	5.89E+03	0.3849	5.89E+03	1.23E+03	1.17E+03	2.61E+03	6.79E+06	2.231	0.913	4.98	2
GWO	5	5.89E+03	0.3847	5.89E+03	1.23E+03	1.17E+03	2.61E+03	6.80E+06	2.231	0.913	4.98	2
PSO	5	5.89E+03	0.3847	5.89E+03	1.23E+03	1.17E+03	2.61E+03	6.81E+06	2.231	0.913	4.98	2
MVO	5	6.01E+03	0.4186	6.01E+03	1.24E+03	1.19E+03	2.67E+03	7.11E+06	2.233	0.913	4.988	2
SCA	5	6.14E+03	0.4179	6.14E+03	1.27E+03	1.22E+03	2.72E+03	7.40E+06	2.232	0.913	4.985	2
GSA	5	1.15E+04	0.9496	1.16E+04	2.35E+03	2.30E+03	5.14E+03	2.64E+07	2.235	0.913	4.996	2
GA	5	5.89E+03	0.3995	5.89E+03	1.23E+03	1.17E+03	2.61E+03	6.81E+06	2.231	0.913	4.98	2
DE	5	6.55E+03	0.9066	6.55E+03	1.36E+03	1.30E+03	2.90E+03	8.44E+06	2.233	0.913	4.987	2

Valid N (listwise)	5											
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Table 2 shows the descriptive statistics values for analysis N, range, minimum, maximum, mean, standard deviation, Skewness, Kurtosis. SOA, SHO, GWO, PSO, MVO, SCA, GSA,GA,DE.

TABLE 3.Correlations

Correlations									
	SOA	SHO	GWO	PSO	MVO	SCA	GSA	GA	DE
SOA	1	1.000**	1.000**	1.000**	1.000**	1.000**	1.000**	1.000**	1.000**
SHO	1.000**	1	1.000**	1.000**	1.000**	1.000**	1.000**	1.000**	1.000**
GWO	1.000**	1.000**	1	1.000**	1.000**	1.000**	1.000**	1.000**	1.000**
PSO	1.000**	1.000**	1.000**	1	1.000**	1.000**	1.000**	1.000**	1.000**
MVO	1.000**	1.000**	1.000**	1.000**	1	1.000**	1.000**	1.000**	1.000**
SCA	1.000**	1.000**	1.000**	1.000**	1.000**	1	1.000**	1.000**	1.000**
GSA	1.000**	1.000**	1.000**	1.000**	1.000**	1.000**	1	1.000**	1.000**
GA	1.000**	1.000**	1.000**	1.000**	1.000**	1.000**	1.000**	1	1.000**
DE	1.000**	1.000**	1.000**	1.000**	1.000**	1.000**	1.000**	1.000**	1

Table 3 shows the correlation between the SOAhighest Correlations1.000**.SHOhighest Correlations1.000**.GWOhighest Correlations1.000**.PSOhighest Correlations1.000**.MVOhighest Correlations1.000**.SCAhighest Correlations1.000**.GSAhighest Correlations1.000**.GAhighest Correlations1.000**.DEhighest Correlations1.000**.

TABLE 4.Reliability Statistics

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.991	1	9

Table 4 shows Cronbach's Alpha Reliability result. The overall Cronbach's Alpha value for the model is 0.991which indicates 70 % reliability. From the literature review, the above 80% Cronbach's Alpha value model can be considered for analysis.

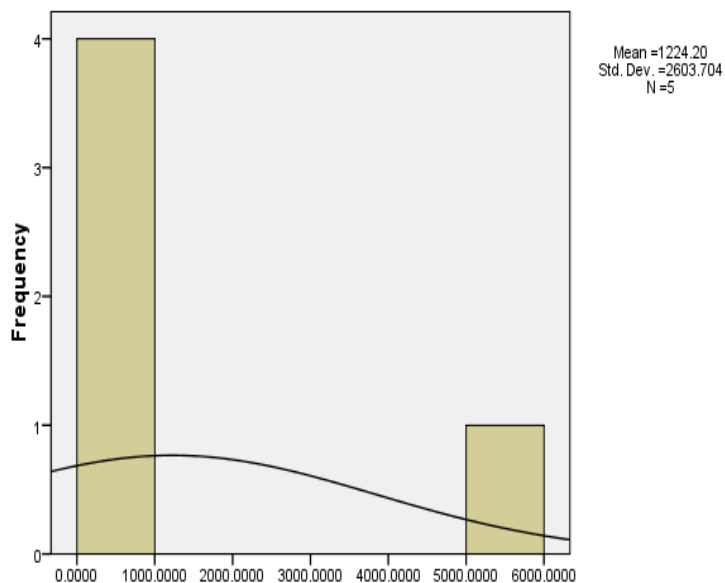


FIGURE 1. SOA

Figure 1 shows a histogram plot for SOAfrom the figure where it can be clearly seen that the data is slightly skewed to the right due to high values for 0 to 5000 normal crows, while all other values are under the normal curve, the sample substantially follows a normal distribution

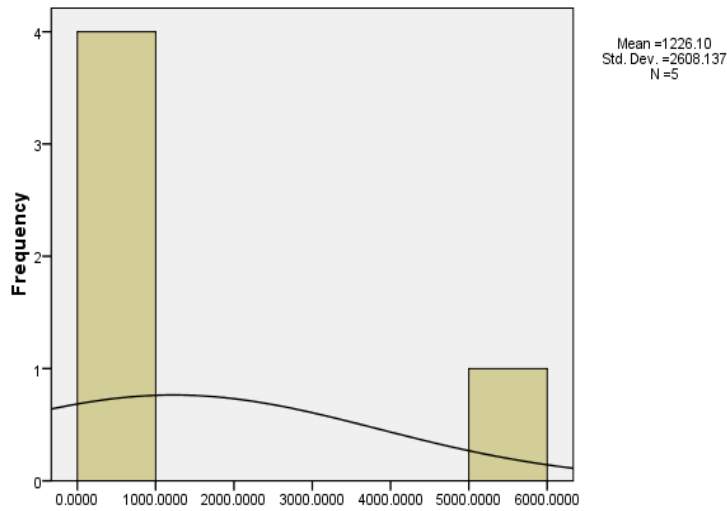


FIGURE 2.SHO

Figure 2 shows a histogram plot for SHO from the figure where it can be clearly seen that the data is slightly skewed to the right due to high values for 0 to 5000 normal crows, while all other values are under the normal curve, the sample substantially follows a normal distribution

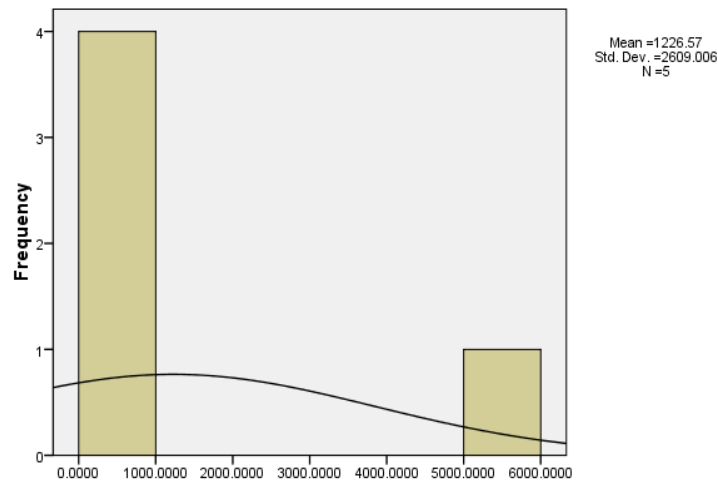


FIGURE 3.GWO

Figure 3 shows a histogram plot for GWO from the figure where it can be clearly seen that the data is slightly skewed to the right due to high values for 0 to 5000 normal crows, while all other values are under the normal curve, the sample substantially follows a normal distribution

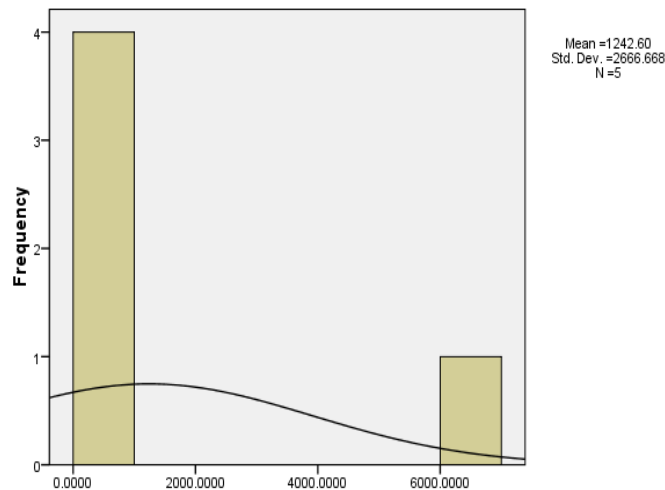


FIGURE 4.PSO

Figure 4 shows a histogram plot for PSO from the figure where it can be clearly seen that the data is slightly skewed to the right due to high values for 0 to 6000 normal crows, while all other values are under the normal curve, the sample substantially follows a normal distribution

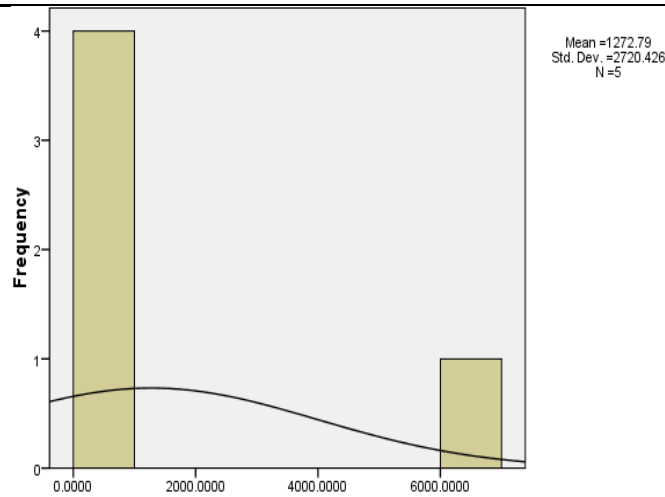


FIGURE 5.MVO

Figure 5 shows a histogram plot for MVO from the figure where it can be clearly seen that the data is slightly skewed to the right due to high values for 0 to 6000 normal crows, while all other values are under the normal curve, the sample substantially follows a normal distribution

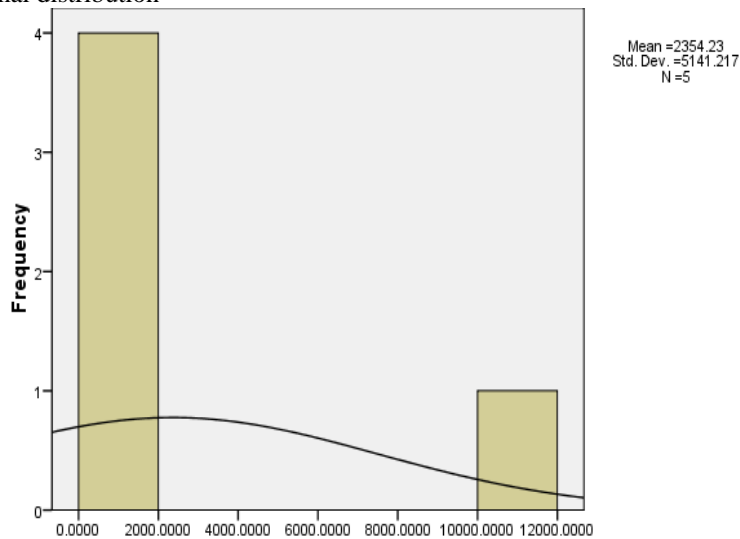


FIGURE 6.SCA

Figure 6 shows a histogram plot for SCA from the figure where it can be clearly seen that the data is slightly skewed to the right due to high values for 0 to 10000 normal crows, while all other values are under the normal curve, the sample substantially follows a normal distribution

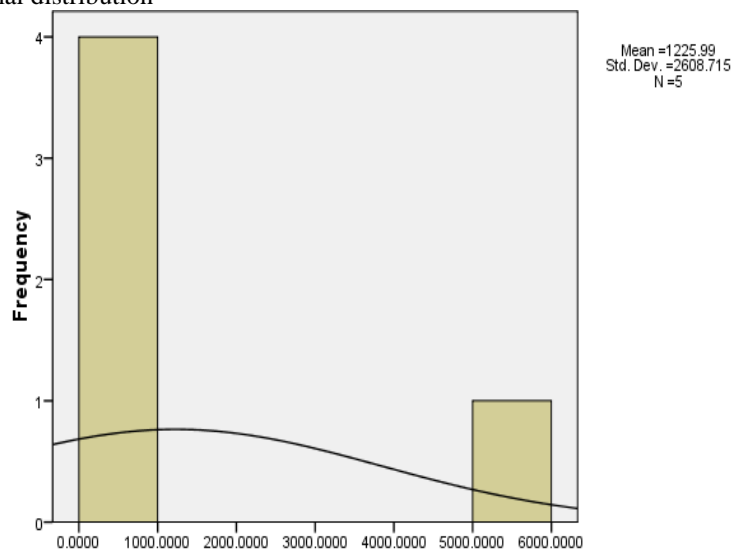


FIGURE 7.GSA

Figure 7 shows a histogram plot for GSA from the figure where it can be clearly seen that the data is slightly skewed to the right due to high values for 0 to 5000 normal crows, while all other values are under the normal curve, the sample substantially follows a normal distribution

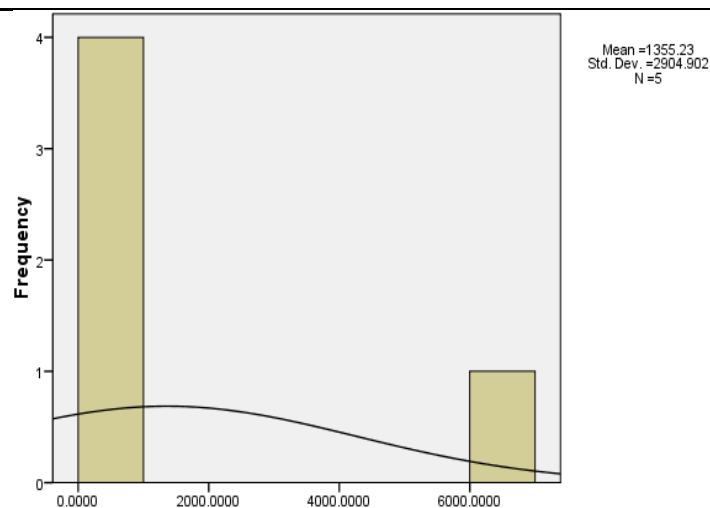


FIGURE 8.GA

Figure 8 shows a histogram plot for GA from the figure where it can be clearly seen that the data is slightly skewed to the right due to high values for 0 to 6000 normal crows, while all other values are under the normal curve, the sample substantially follows a normal distribution

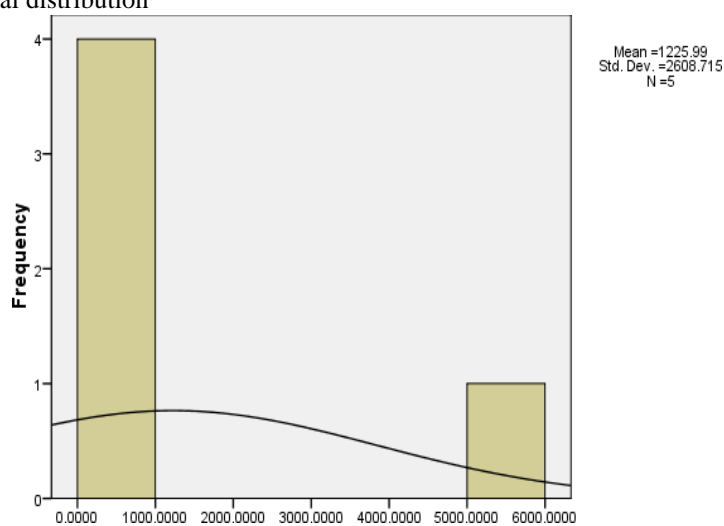


FIGURE 9.DE

Figure 9 shows a histogram plot for DE from the figure where it can be clearly seen that the data is slightly skewed to the right due to high values for 0 to 5000 normal crows, while all other values are under the normal curve, the sample substantially follows a normal distribution

Conclusion

Successful use of an enzyme as an industrial biochem for implementation, under the required operating conditions of operational efficiency and cost-effectiveness basically improved functionality, uniqueness and economical and suitable with stability requires presence of the enzyme. Multiple protein engineering to provide Strategies is developed tailors. Web services standards and technologies Using SOA mainly for business information systems used and for enterprise information systems are fast becoming a standard approach. Supply Industry such as chain management order entry SOA has been successfully applied to organizations systems The MVO algorithm measures the growth of individual populations It depends. Every person finds it a promising solution Consider. Information on several possible solutions Shares and focus on promising areas Communicate with each other to go. Best solution is, External to CT or MR-derived quantitative measurements Aortic diameter should be reported. It is important because the size of the lumen is external to the intraluminal and does not accurately reflect the thrombus, its diameter aorta in the aortic wall structure. Inflammation, on the other hand, there are many factors to consider Classification is a complex problem, and Because of this, there are various classification techniques in the literature are proposed. By the GSA algorithm Improved multiple classification problems are described. Two clauses are considered for purpose, original GSA and GSA's Transformations and classification problems hybrids.

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