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## CURRICULUM VITAE

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### 1.0 BIODATA

NAMES: Henry Kasumba  
NATIONALITY: Ugandan  
DATE OF BIRTH: 01.01. 1981  
CONTACT ADDRESS: Makerere University, College of Natural Sciences  
Department of Mathematics  
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### 2.0 PERSONAL STATEMENT

I am currently a lecturer at the department of mathematics, Makerere University, Uganda and formerly a research scientist at the Johann Radon Institute for Computational and Applied Mathematics (RICAM) , which is part of the Austrian Academy of Sciences. I have deep interests in mathematical modeling of industrial related problems and have participated in a number of activities such as the ECMI Modelling week in KongensLyngby, Copenhagen, Denmark in 2006, Philips medical systems modeling week at Technical University Eindhoven, the Netherlands, in March 2007 and the 19th European Conference on Mathematics for Industry which was held in Santiago de Compostela (Spain) on 13-17th June 2016. My research interests are areas of scientific computing, modeling using differential equations and optimization and optimal control of differential equations.

### 3.0 EDUCATION

INSTITUTION AND LOCATION	DEGREE	Completion Date MM/YYYY	FIELD OF STUDY
Radon institute of computational and applied Mathematics	Post- Doctoral	04/2014	Mathematics (Numerical Analysis and Optimization)
University Graz, Austria	PhD	10/2010	Mathematics(Numerical Analysis and Optimization)
Johannes Kepler University, Linz, Austria and Eindhoven University of Technology- Netherlands	MSc	06/2007	Computational science and Engineering
Makerere University, Kampala, Uganda	BSc/Educ	04/2004	Mathematics, Physics, Education

### 4.0 PROFESSIONAL APPOINTMENT

2016–date Honorary Lecturer, Mbarara University of Science and Technology, Uganda.  
2016-present Lecturer Department of Mathematics, Makerere University.  
2014-2015 Part-time Senior lecturer, Uganda Christian University  
2011-2014 Research Scientist, Radon Institute of Computational and Applied Mathematics of the

2007-2010 Austrian Academy of Sciences, Linz, Austria.  
 Project collaborator in the Doctoral School-Numerical simulation in technical  
 Sciences(Karl-Franzens University and Technical UniversityGraz, Austria).

## 5.0. TEACHING EXPERIENCE

### 5.1 MAKERERE UNIVERSITY

Period: Jan: 2016-date

Position: Lecturer

Courses Taught

Course Name	Code	Level
Engineering Mathematics III and IV	EMT2101&EMT2201	BSC
Statistical Inference	MTH3109	BSC
Probability Theory	MTH2102	BSC
NumericalAnalysis II	MTH3102	BSC
Advanced Numerical Programming	MTA 7118	MSC
Computational Fluid Dynamics	MTA7219	MSC
Advanced Engineering Mathematics	EMT7201	MSC
Numerical methods for PDEs	MTA7202&MTH 9305	MSC and PhD
Partial Differential Equations	MTA 7103&MTH 9203	MSC and PhD
Large Scale Optimization	MTH 9424	PhD
Optimization	MTH9202	PhD
Control Theory	MTH 9421	PhD

### 5.2 REGIONAL AND INTERNATIONAL UNIVERSITIES

Period	University	Course Taught
06.2019-07.2019	Royal University of Phnom Penh, Cambodia	Optimization and Applications Level( Msc)
06.2018-07.2018	University of Rwanda	Applied Optimization Level: Msc.

## 6.0 STUDENT SUPERVISION

The following are students I have supervised since my appointment as a Lecturer, Department of Mathematics

### 6.1 MSC STUDENTS: COMPLETED SINCE APPOINTMENT

Name	Reg. No	Title
Isaac Enyogoi	2014/HD13/185U	Numerical Simulation of a Two Dimensional Groundwater Pollute Transport Problem Using Incompressible Steady State Navier-Stokes Equations and a Diffusion-Convection Equation
Francis Mugabi	2016/HD13/485U	Modelling Environmental Transmission of Foot and Mouth Disease with Emergency Vaccination and Physical Barriers
Okello Oun Lawrence	2019/HD13/897U	On a constitutive error cost functional for a Bernoulli Free Boundary Problem
Musisi Pascal	2020/HD13/17393U	Lotka-Voltera –Prey Model with Spatial Effects, Population Diffusion Phenomenon and Seasonal Migration
Mugabi Muhmadi	2021/HD13/2568U	Dividend Maximisation In an Insurance-Investment Model Using Runge-Kutta Scheme

### 6.2 MSC STUDENTS: ONGOING

Name	Reg. No	Title
Nalutaya Justine	2019/HD13/895U	A spectral Method for solving a two dimensional advection dominated-diffusion Equation
Abel Alinitwe	2020/HD13/24378U	Optimal Control of a Fractional order Diffusion Equation

### 6.3 PHD STUDENTS: COMPLETED SINCE APPOINTMENT

Name	Reg. No	Title
Anguzu Collins	2016/HD13/4313U	Mathematical Methods for Updating Centrality Measures Based on Powers of the Adjacency Matrix for Changing Networks
Arop Martin	2016/HD13/3401U	Optimal Control of a wave Equation Using Actuator Design and Placement

### 6.4 PHD STUDENTS: : ONGOING

Name	Reg. No	Title	Status
Nanyondo Josephine	2016/HD13/18999U	Mathematical modeling of heterogeneous traffic flow on an urban road network	Ongoing
Kikabi Yasin	2016/HD13/18872U	Identification of Interaction of Graphical Structures from time Series Data of Allele Frequencies	Ongoing
Katende Ronald		Deep Learning Methods for Free Boundary Problems	Ongoing

## 7.0. RESEARCH PUBLICATIONS

### 7.1 REFEREED JOURNALS

18. R KATENDE, **H KASUMBA**, G KAKUBA, J. M MANGO.: On the Error Bounds for ReLU Neural Networks. IAENG International Journal of Applied Mathematics, Vol.54.No.12. Pages 2602-2611 **(2024)**
17. R KATENDE, **H KASUMBA**, G KAKUBA, J.M MANGO.: A proof of convergence and equivalence for 1D finite element methods and ReLU neural networks. Annals of Mathematics and Computer Science, Vol.25.Pages 97-111 **(2024)**
16. J. NANYONDO, **H. KASUMBA**, J. MUGISHA.: Analysis of heterogeneous vehicular traffic: Using proportional densities. Physica A: Statistical Mechanics and its Applications. Vol.633. Pages 129387, (2024) DOI: <https://doi.org/10.1016/j.physa.2023.129387>
15. M. D. AROP, **H. KASUMBA**, J. KASOZI, F. BERNTSSON .Optimal actuator design for control of vibrations induced by pedestrian-bridge interactions. Mathematics in Applied Sciences and Engineering, Vol. 5, No. 2. 85-184. DOI: <https://doi.org/10.5206/mase/16958> . **(2024)**.
14. M. D. AROP, **H. KASUMBA**, J. KASOZI, F. BERNTSSON, Optimal actuator placement for control of vibrations induced by pedestrian-bridge interactions. Mathematics in Applied Sciences and Engineering, Vol. 4 No. 3 (2023): pp.154-248 . DOI: <https://doi.org/10.5206/mase/15949>
13. C. ANGUZU, C. ENGSTROM, **H. KASUMBA**, J. M. MANGO, S. SILVESTROV.: Algorithms for Recalculating Alpha and Eigenvector Centrality Measures using Graph Partitioning Techniques. In: A. Malyarenko, Y. Ni, M. Rancic, S. Silvestrov. (eds), Stochastic Processes, Statistical Methods, and Engineering Mathematics, Springer, **(2022)**
12. F. MUGABI, J.Y.T. MUGISHA, B. NANNYONGA, **H. KASUMBA**, M.TUSIIME.: Parameter dependent transmission dynamics and optimal control of foot and mouth disease in a contaminated environment. *Journal of the Egyptian Mathematical Society*. Volume 27, Number 53 **(2019)**.
11. **H. KASUMBA**, J. MANGO: Boundary Control of a Bernoulli Free Boundary Problem. *International Journal of Mathematics and Computation*. Volume 28, Number 2 ( 2017) pp. 40-56.
10. J. NYENDE, I. ENYOGOI, J. MANGO, **H. KASUMBA**. Numerical Simulation of a Two-Dimensional Groundwater Pollute Transport Problem Using Incompressible Steady-State Navier-Stokes Equations and Diffusion-Convection Equations. *Modelling and Simulation in Engineering*. Volume **2022**, Article ID 7419502, 20 pages, DOI: 10.1155/2022/7419502.
9. **H. KASUMBA**, G. KAKUBA, J. MANGO: A second order fixed domain approach to a shape optimization problem. In Quintela, P., Barral, P., Gomez, D., Pena, F.J., Rodriguez, J., Salgado, P., Vazquez-Mendez, M.E. (Eds.): *Progress in Industrial Mathematics at ECMI 2016*, Springer Mathematics in Industry Series, Vol. 26 **(2017)**.

8. **H. KASUMBA**, K. KUNISCH, A. LAURAIN: A Bilevel shape optimization problem for the exterior Bernoulli free boundary problem. *Interfaces and Free boundaries*, Volume 16, Issue 4, **2014**, pp. 459–487 DOI: 10.4171/IFB/326.
7. **H. KASUMBA**: Shape optimization approaches to free surface problems. *International Journal of Numerical Methods in Fluids*, Volume 74, Number 11 (**2014**), pp. 818-845.
6. **H. KASUMBA**, K. KUNISCH: On computation of shape Hessian of the cost functional without shape sensitivity of the state variable. *Journal of Optimization theory and Appl.*, Volume 162, Issue 3(**2014**), pp. 779-804.
5. E. F. CARA, T. HORSINY, **H. KASUMBA**: Some inverse and control problems for fluids. *Annales mathématiques Blaise Pascal* 20 no. 1 (**2013**), pp. 101-138.
4. **H. KASUMBA**, K. KUNISCH: Vortex control of instationary channel flows using translation invariant cost functionals. *Computational Optimization and Applications* (**2013**) 55, pp.227-263
3. **H. KASUMBA**, K. KUNISCH: On a free surface PDE constrained shape optimization problem. *Applied Mathematics and Computation* 218 (**2012**) pp. 11429-11450
2. **H. KASUMBA**, K. KUNISCH: Vortex control in channel flows using translation invariant cost functionals. *Computational Optimization and Applications*, Volume 52, Number 3 (**2012**), pp.691-717.
1. **H. KASUMBA**, K. KUNISCH: On shape sensitivity analysis of the cost functional without shape sensitivity of the state variable. *Control and Cybernetics*. Vol 40(4) (**2011**), pp. 989-1017.

## 7.2 TECHNICAL REPORTS

- (1) **HENRY KASUMBA**, TEFAKAISARA, VIDARHRAFNKELSSON, KONSTANTIN LOFINK , JOANNA SYLVIA PELC, YAYUN ZHOU, UTE ZIEGLER. Mathematical Models For A Fishing Rod And The Action Of Casting With A Bait. ECMI modelling week report Copy available at <http://www2.mat.dtu.dk/people/M.P.Soerensen/ModellingWeek/team5.pdf>
- (2) **HENRY KASUMBA**, SINATRA KHO, CARINA VAN DER WALT, MOCHAMAD APRIL. Effects Of Gravity On Contrast Agent Dispersion In Blood Vessels, Tu-Eindhoven. Modeling Week Report. March 2007.
- (3) **HENRY KASUMBA**, STEPHEN L. KEELING, MARKUS MULLER, Decay estimate addendum to: Revision of the theory of tracer transport and convolution model of DCE-MRI. SFB-Report 2010-022. A copy is accessible at [http://math.uni-graz.at/invcon/medimage/kernel1\\_ad.pdf](http://math.uni-graz.at/invcon/medimage/kernel1_ad.pdf)

## 7.3 SUMMITTED PAPERS

- (1) C. ANGUZU, C. ENGSTROM, J. M. MANGO, **H. KASUMBA**, S. SILVESTROV, B. ABOLA.: Eigenvector Centrality and Uniform Dominant Eigenvalue of Graph Components (submitted to: Journal of Applied Numerical Mathematics. (2021))
- (2) **H. KASUMBA**: A Shape Optimization Approach For A Batchelor Flow Problem. (submitted to AMC (2024))
- (3) J. NANYONDO, **H. KASUMBA**, J. MUGISHA.: The time-fractional multi-class Aw-Rascle traffic flow model (submitted to: Journal of Computational Physics. (2025))

## 8.0 CONFERENCES, WORKSHOPS AND SUMMER SCHOOLS ATTENDED

1. Stakeholders Workshop on minimum standards for Bachelor of Science Degree in Mathematics , National Council of Higher Education, Uganda,(21-09-2020)
2. The 19th European Conference on Mathematics for Industry, Department of Applied Mathematics, Universidade de Santiago de Compostela, Spain, 13-17th June **2016**.
3. 6th IFIP TC7 Conference 2013 on System Modelling and Optimization, Institute of Mathematics, Alpen-Adria Universität Klagenfurt, Austria, Sept. 2013.
4. Conference on Domain Decomposition Methods for Optimization with PDE Constraints, Monte Verita, Ascona, Switzerland, Sept. 2013.
5. International colloquium in Trends in optimization and optimal control. Graz- Austria, Sept. 2012.
6. 41<sup>st</sup> National Congress of Numerical Analysis (CANUM 2012) Super-Besse, Belambra- France,21-25th May 2012.
7. Workshop on Numerical Methods for Optimal Control and Inverse Problems, March 12-14, 2012.TechnischeUniversitätMünchen, Faculty of Mathematics Garching by Munich-Germany.

8. International Workshop on Control and Optimization of PDEs, 10-14 October 2011. Mariatrost -Graz, Austria.
9. 15th Austrian-French-German Conference on Optimization, 19-23 September 2011. 1, place Emile Blouin - Toulouse, France
10. 15th International Conference on Methods and Models in Automation and Robotics 23-26 August 2010. Amber Baltic Hotel, Miedzyzdroje, Poland.
11. Workshop on first tutorial on freefem++ Pde solver. Institut Henri Poincaré (IHP) Paris-France. September 14-15, 2009.
12. Workshop on Nonlinear PDE and Free Boundary Problems. Mathematics Institute, University of Warwick, Coventry, United Kingdom. June 15-19, 2009.
13. International Workshop on Advances in Shape and Topology Optimization, University of Graz, Austria, September 25-27, 2008.
14. Participant in Mathematics for Industry modeling week, Technical University of Eindhoven, The Netherlands. March 26th - April 4th 2007.
15. Participant in 20th ECMI modeling week, Technical University of Denmark Lyngby Denmark. August 13<sup>th</sup> - 24<sup>th</sup> 2006.
16. Participant on 2nd course on basic discrete combinatorial mathematics 30th May -10th June 2005. Nairobi Kenya.
17. Participant of the third Eastern Africa workshop on algebra, geometry and combinatorics, 19th-30th, Jan, 2005, Kampala, Uganda.

## 9.0 ACADEMIC HONORS AND AWARDS

2007-2010	PhD project grant: supported by Austrian Science Foundation (FWF) .
04.2010	European Science Foundation travel grant, Grant awarded to support academic visit to Charles University Prague, Czech Republic.
2005-2007	Erasmus-Mundus-scholarship in Industrial and Applied mathematics, Offered by European-Union to study a joint masters degree in Industrial and Applied Mathematics at TU-Eindhoven, The Netherlands and Johannes-Kepler University-Linz-Austria .
2004-2005	The East African Universities Mathematics Programme (EAUMP)-scholarship, Offered to study master of Mathematics at Makerere-University-Uganda .

## 10.0 SERVICE TO PROFESSION

### 10.1 REVIEWS

I am a peer reviewer of following journals

1. ESAIM: Mathematical Modelling and Numerical Analysis.
2. Journal Mathematics (ISSN 2227-7390) .
3. Applied Mathematics and Computation
4. American Mathematical Society (Math Reviews)

### 10.2 EXTERNAL EXAMINATION

I have examined the following external MSC dissertations

1. Modelling flow and sediment transport in urban Sewer Systems using Computational Fluid Dynamics by Akawai Filbert-Reg BU/GS16/MIM/1 (Busitema University) **2022**
2. Application of computational Fluid Dynamics in Simulation and Optimization of a Fluidized sugar Bed Dryer by Nabasiye Susan, BU/GS19/MIM/6 (Busitema University) **2022**
3. Optimising Municipal Sewage Networks Using Computational Fluid Dynamics Case study: Tororo Municipality, Uganda by Esemu Joseph Noah, BU/GS16/MIM/2, (Busitema University) **2018**

### 10.3 CURRICULUM DESIGN AND REVIEW

- Developed minimum standards for Bachelor of Science degree in Applied mathematics for the National council of Higher Education. Jan 28<sup>th</sup> 2020-September 8<sup>th</sup> 2020.
- Participated in the development of PhD Maths by Coursework and Dissertation curriculum (Makerere University). 2016

- Participated in the development of MSc Mathematical Modelling and MSC math Curricula (Makerere University). 2016

## 11.0 SERVICE TO COMMUNITY

### 11.1 UGANDA MATHEMATICAL SOCIETY

I am a member of Uganda Mathematical society and been actively involved in organization of National Mathematical contests. Further, I have been involved in training of high school students in preparation of international mathematical contests.

### 11.2 MAKERERE UNIVERSITY RETIREMENT BENEFITS SCHEME (MURBS)

I am an ambassador of MURBS since 2<sup>nd</sup> February 2018. I have endorsed and promoted MURBS' values, beliefs and mission at my department. I have participated in training and team building activities of the scheme. Such trainings have helped me acquire financial skills which I have consequently shared with members of my department. I have also participated in bringing MURBS services closer to my members of department for instance, printing member statements during the AGM.

## 12.0 ORGANIZATION OF MEETINGS

- The joint african-nordic conference in mathematics under the theme: celebrating 20 years with isp/eaump/sida, 10years with cimo/hei-ici and commencing of the norhed ii funded mathematics for sustainable development project. 27th to 29th October 2022 (Member local organizing committee)

## 13.0 SHORT TERM SCIENTIFIC VISITS

- 01.2018: Invitation from Prof. Bengt Ove Turesson, University of Linkoping, Sweden.
- 04.2010: Invitation from Prof. Jaroslav Haslinger, Charles University in Prague, Czech Republic.
- 11.2009: Invitation from Prof. Boris Vexler, Technical University Munich, Germany

## 14.0 REFERENCES

Prof. Dr. Karl Kunisch  
Head Institute for Mathematics and Scientific Computing,  
University of Graz, Heinrichstr. 36, A-8010 Graz, Austria,  
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Prof. John Mango  
Makerere University,  
P.O. Box. 7062, Kampala, Uganda.  
Email : mango.john@mak.ac.ug

Prof. John Bbaale,  
Dean School of Economics,  
College of Business and Management Sciences,  
Makerere University,  
P.O.Box 7062, Kampala,  
Email: ebbaale@fema.mak.ac.ug

### Certification:

I, the undersigned, certify that to the best of my knowledge and belief, this data correctly describes me, my qualifications, and my experience.



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HENRY KASUMBA

24/03/2025

