**Waseem Hussain**

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Website: <https://whussain2.github.io/>

Postdoctoral Research Associate

[Department of Agronomy and Horticulture](https://agronomy.unl.edu/)

University of Nebraska Lincoln USA

**Research Interests**

Incorporating quantitative genetics, genomics, bioinformatics, statistics and high-throughput phenotyping to bridge the gap between phenotype and genotype. The primary research areas I want to focus is a characterization of alleles, cloning and isolation of genes, and integration through marker-assisted breeding. Identification and mapping of genomic regions (via linkage and association) with emphasis on abiotic and biotic stresses, and integration of genomic selection/predictions in cultivar and hybrid development using advanced genomic and phenotyping tools.

**Education**

**Ph.D. in Agronomy (Plant Breeding & genetics); May 2017**

[University of Nebraska Lincoln USA](https://agronomy.unl.edu/)

* Dissertation: “*Development of High-Density Linkage Map and QTL Mapping for Agronomic Traits in Bread Wheat Evaluated Across Multiple Rainfed Environments*”
* Advisor: [Prof. P. Stephen Baenziger](https://agronomy.unl.edu/baenziger)

**M.S. in Agriculture (Plant Breeding & Genetics); Dec. 2011**

[Shere-I-Kashmir Univ. of Agric. Sci. and Technol. Kashmir, India](http://www.skuastkashmir.ac.in/)

* Dissertation: “*Studies on heterosis and combining ability for hybrid rice development under temperate conditions*”
* Advisor: Dr. Gulzar Singh Sangehra

**B.S. in Agriculture, June 2009**

Sher-I-Kashmir Univ. of Agric. Sci. and Technol. Kashmir, India

**Research Experience**

**Postdoctoral Research Associate**

**March 2018 to Current:**

Department of Agronomy and Horticulture, University of Nebraska - Lincoln

* Supervisors: [Gota Morota](https://www.apsc.vt.edu/OurPeople/Faculty/GotaMorota.html)and [Harkamal Walia](https://agronomy.unl.edu/walia)
* **Responsibilities:**
  + Quantitative genetic analysis of longitudinal high-throughput image data of night temperature stress in wheat and rice.
  + Perform genome-wide analysis and genomic predictions of high-throughput image data combined with high dimensional genomic, transcriptomic and metabolomics data.
  + Modelling variance-heterogeneity in genome-wide association studies using novel statistical tools.
  + Develop R-packages and Shiny applications.

**Research Associate Scientist-II (Wheat Breeder)**

**May 2017 to December 2017:**

Maharashtra Hybrid Seed Company ([MAHYCO](https://mahyco.com/)), Aurangabad, Jalna, India

* The goal was to develop wheat lines and hybrids using advanced statistical and genomics tools.

**Ph. D (**[**ICAR International Fellow**](https://icar.org.in/)**and Graduate Research Assistantship)**

**January 2014 to April 2017:**

* + Focused on the development and evaluation of RIL mapping population related to drought tolerance.
  + Development of high-density linkage map based on SNPs derived from genotyping by sequencing.
  + Genome-wide QTL mapping for various agro-physiological traits phenotyped across a wide range of environments.
  + High-throughput phenotyping in wheat and soybean using newly developed phenotyping platforms.
  + Genome selection/predictions in Nebraska Wheat breeding program.
  + Gained proficiency in statistical analysis and programming including Unix operating system, Perl languages, GBS data analysis, and statistical analysis using R packages and SAS software.
  + Conducted extensive field trials, crossing, phenoyping and data collections across multiple environments for the four years.
  + Analyzed multi-environment phenotypic data in ASREML package in R and incorporating spatial corrections using mixed linear models and generate variance components.
  + BLUP/BLUE estimates for genomic selections and QTL mapping.
  + Molecular mapping of Tan spot resistance in wheat.

**Research Fellow (**[**INSPIRE Fellowship**](http://www.inspire-dst.gov.in/)**)**

**December 2011 to December 2013**

Agricultural University, [CSKHPKV](http://www.hillagric.ac.in/), Palampur India.

* + Diversity analysis in oats, screening and molecular mapping of powdery mildew resistance in oats.
  + Double haploid breeding in wheat using *Imperata cylindrica* grass.

**Graduate Research Assistant (M.S.)**

**June 2009 to December 2011**

* Identification of potential restorers for newly developed temperate CMS lines and identify the heterotic combinations.

**Publications**

**Under Preparation**

* Hussain, W., Walia, H., Jarquin, D., and Morota, G. 2019. **Variance-heterogeneity genome-wide mapping for cadmium in wheat (*Triticum Aestivum* L.) revealed novel genomic regions and candidate genes.** Target Journal: *BMC Plant Biology.*
* Hussain, W., Belamkar, V., Guttieri, M.J., Poland, J and Baenziger, P.S. 2019**. Genotyping-by-sequencing derived high-density linkage map reveled novel genomic loci and candidate genes for plant height in wheat (*Triticum Aestivum* L.)** Target Journal: *The Plant Journal.*

**Peer-Reviewed articles**

* Kariyawasam, G. K., **Hussain, W**., Easterly, A., Guttieri, M., Belamkar, V., Poland, J., et al. 2018. [**Identification of quantitative trait loci conferring resistance to tan spot in a bi-parental population derived from two Nebraskan hard red winter wheat cultivars**](https://whussain2.github.io/publications/2018-11-01-Identification-of-quantitative-trait-loci-conferring-resistance-to-tan-spot-in-a-bi-parental-population-derived-from-two-Nebraskan-hard-red-winter-wheat-cultivars)**.** *Mol Breeding*. 38.

### **Hussain, W**., Campbell, M., Walia, H., and Morota, G. 2018. [**ShinyAIM: Shiny-based application of interactive Manhattan plots for longitudinal genome-wide association studies.**](https://whussain2.github.io/publications/2018-10-08-ShinyAIM-Shiny-based-application-of-interactive-Manhattan-plots-for-longitudinal-genome-wide-association-studies)*Plant Direct*. 2: e00091.

### Sallam, A., Mourad, A. M. I., **Hussain, W**., and Stephen Baenziger, P. 2018. [**Genetic variation in drought tolerance at seedling stage and grain yield in low rainfall environments in wheat (*Triticum aestivum L.).***](https://whussain2.github.io/publications/2018-08-01-Genetic-variation-in-drought-tolerance-at-seedling-stage-and-grain-yield-in-low-rainfall-environments-in-wheat)*Euphytica*. 214:169.

### **Hussain, W**., Guttieri, M. J., Belamkar, V., Poland, J., Sallam, A., and Baenziger, P. S. 2018. [**Registration of a bread Wheat recombinant inbred line mapping population derived from a cross between ‘Harry’ and ‘Wesley’.**](https://whussain2.github.io/publications/2018-07-02-Registration-of-a-bread-wheat-recombinant-inbred-line-mapping-population-derived-from-a-cross-between-Harry-and-Wesley)*Journal of Plant Registrations*. 12:411–414.

* **Hussain,W**., Baenziger, P.S., Belamkar, V., Guttieri, M.J., Venegas, J.P., Easterly, A., Sallam, A., and Polland, Jesse. 2017.[**Genotyping-by-sequencing derived high-density linkage map and its application to QTL mapping of flag leaf traits in bread wheat.**](http://whussain2.github.io/publications/2017-11-27-Genotyping-by-sequencing-derived-high-density-linkage-map-and-its-application-to-QTL-mapping-of-flag-leaf-traits-in-bread-wheat)  *Scientific Reports*.

### Belamkar, V., Guttieri, M. J., **Hussain, W**., Jarquín, D., El-basyoni, I., Poland, J., et al. 2018. [**Genomic selection in preliminary yield trials in a winter wheat breeding program.**](https://whussain2.github.io/publications/2018-06-19-Genomic-selection-in-preliminary-yield-trials-in-a-winter-wheat-breeding-program)*G3*: *Genes|Genomes|Genetics*. 8:2735–2747.

### Bai, G., Ge, Y., **Hussain, W**., Baenziger, P. S., and Graef, G. 2016. **A multi-sensor system for high throughput field phenotyping in soybean and wheat breeding.** *Computers and Electronics in Agriculture*. 128:181–192.

### Badiyal, A., Chaudhary, H. K., Jamwal, N. S., Bhatt, A. K., and **Hussain, W**. 2016. [**Comparative assessment of different auxin analogues on haploid induction in triticale x wheat derived backcross generations.**](https://whussain2.github.io/publications/2016-06-01-Comparative-assessment-of-different-auxin-analogues-on-haploid-induction-in-triticale-x-wheat-derived-backcross-generations)*Agricultural Research Journal*. 53:157.

### Jamwal, N. S., Chaudhary, H. K., Badiyal, A., and **Hussain, W**. 2016. [**Factors influencing crossability among triticale and wheat and its subsequent effect along with hybrid necrosis on haploid induction.**](https://whussain2.github.io/publications/2016-04-02-Factors-influencing-crossability-among-triticale-and-wheat-and-its-subsequent-effect-along-with-hybrid-necrosis-on-haploid-induction)*Acta Agriculturae Scandinavica, Section B — Soil & Plant Science*. 66:282–289.

### Sood, V. K., Rana, I., **Hussain, W**., and Chaudhary, H. K. 2016. [**Genetic diversity of genus*Avena* from North Western-Himalayas using molecular markers.**](https://whussain2.github.io/publications/2016-03-01-Genetic-diversity-of-genus-Avena-from-North-Western-Himalayas-using-molecular-markers) *Proc. Natl. Acad. Sci., India, Sect. B Biol. Sci****.*** 86:151–158.

### Chaudhary, L., Sood, V.K., and **Hussain, W**.2015. [**Genetic analysis for grain and forage yield and its component traits in genus *Avena* under North western Himalayas**](https://whussain2.github.io/publications/2015-05-02-Genetic-analysis-for-grain-and-forage-yield-and-its-component-traits-in-genus-Avena-under-North-western-Himalayas)**.** *Range Management and Agroforestry****.*** 35:2.

### Badiyal, A., Chaudhary, H. k., Jamwal, N. s., **Hussain, W**., Mahato, A., and Bhatt, A. k. 2014. [**Interactive genotypic influence of triticale and wheat on their crossability and haploid induction under varied agroclimatic regimes.**](https://whussain2.github.io/publications/2014-06-15-Interactive-genotypic-influence-of-triticale-and-wheat-on-their-crossability-and-haploid-induction-under-varied-agroclimatic-regimes)*Cereal Research Communications*. 42:700–709.

### Sanghera, G. S., and **Hussain, W**. 2012. [**Heterosis and combining ability estimates using line x tester analysis to develop rice hybrids for temperate conditions.**](https://whussain2.github.io/publications/2012-08-30-Heterosis-and-combining-ability-estimates-using-line-x-tester-analysis-to-develop-rice-hybrids-for-temperate-conditions)*Notulae Scientia Biologicae*. 4:131–142.

### **Hussain, W**., and Sanghera, G. S. 2012. [**Exploitation of heterosis in rice (*Oryza sativa L.*) using CMS system under temperate conditions.**](https://whussain2.github.io/publications/2012-03-05-Exploitation-of-heterosis-in-rice-using-CMS-system-under-temperate-conditions)*Electronic Journal of Plant Breeding*. 3(1):695-700.

### Sanghera, G. S., Wani, S. H., **Hussain, W**., and Singh, N. 2011. [**Engineering cold stress tolerance in crop plants.**](https://whussain2.github.io/publications/2011-01-01-Engineering-cold-stress-tolerance-in-crop-plants)*Curr. Genomics*. 12, 30–43.

**Book Chapters**

* Rana,M., Sood, A., **Hussain, W**., Kaldate, R., Sharma, T.R., Gill, R.K., Kumar, S., Singh, S. (2019). In: Mohar Singh (eds), *Gene Pyramiding and Multiple Character Breeding*, Lentils: Potential Resources for Enhancing Genetic Gains, 2019, Pages 83-124.
* Sanghera, G.S., Wani, S.H., **Hussain, W**., and Singh, N.B. (2015). *Genetic Engineering for Cold Stress Tolerance in Crop Plants*. In book: Advances in Genome Science, Edition: Volume 4, Publisher: Bentham Science, Editors: Atta-ur-Rahman, pp. 173-201.
* Chaudhary, H.K., Kaila, V., Rather, S.A., Badiyal, A., **Hussain, W**., Jamwal, N.S., and Mahato, A. (2013). In: Pratap and J. Kumar (eds.), *Alien Gene Transfer in Crop Plants, Volume Achievements and Impacts*. Springer, pp 1-26.
* **Hussain, W**., Sanghera, G.S., Jamawal, N.S, and Badiyal,A. (2013). *Crop improvement through genomic interventions in sustainable way*. In: Malik CP, Sanghera GS and Sharma P(ed) Crop improvement: An integrated approach. MD Publications Pvt Ltd, New Delhi. pp 61-68. ISBN 978-81-7533-456-4.
* Dar, S.H., **Hussain, W**., and Sanghera, G.S. (2013). *Advances in hybrid rice technology through applications of novel technologies*. In: Malik CP, Sanghera GS and Sharma P(ed), Crop improvement: An integrated approach. MD Publications Pvt Ltd, New Delhi. pp 1-12.

**Talks**

### [**ShinyAim: Shiny-Based Application of Interactive Manhattan Plots for Longitudinal GWAS**](https://whussain2.github.io/talks/2018-11-06-Shiny-Based-Application-of-Interactive-Manhattan-Plots-for-Longitudinal-GWAS.)**.**

November 06, 2018

Conference Talk at ASA, CSSA Meeting (2018), Baltimore, Maryland

### [**Shiny Based Imaging GWAS Server**](https://whussain2.github.io/talks/2018-05-05-Shiny-Based-Imaging-GWAS-Server)**.**

May 05, 2018

Invited Talk at University of Nebraska Department of Statistics, Lincoln, Nebraska

### [**Genotyping-by-sequencing Derived High-Density Linkage Map and its Application to QTL Mapping of Flag Leaf Traits in Bread Wheat**](https://whussain2.github.io/talks/2017-04-05-Genotyping-by-sequencing-Derived-High-Density-Linkage-Map-and-its-Application-to-QTL-Mapping-of-Flag-Leaf-Traits-in-Bread-Wheat)**.**

April 05, 2017

Invited Talk at Plant Breeding and Genetics Symposium, Manhattan, Kansas

### [**New tools to Understand and Improve Wheat in Genomics Era**](https://whussain2.github.io/talks/2017-02-10-New-tools-to-Understand-and-Improve-Wheat-in-Genomics-Era)**.**

February 10, 2017

Invited Talk at Maharashtra Hybrid Seed Company (MAHYCO) India, Dawalwadi, Jalna, Maharashtra, India

### [**Development of High-Density Linkage Map in Wheat and Genome-Wide QTL Mapping for Plant Height**](https://whussain2.github.io/talks/2016-03-29-Development-of%20High-Density-Linkage-Map-in-Wheat-and-Genome-Wide-QTL-Mapping-for-Plant-Height)**.**

March 29, 2016

Invited symposium Talk at Nebraska Plant Breeding Symposium 2017, Lincoln, Nebraska

### [**Association Mapping and its Role in Crop Improvement**](https://whussain2.github.io/talks/2014-08-05-Association-Mapping-and-its-Role-in-Crop-Improvement)

August 05, 2014

Ph.D seminar talk at University of CSKHPKV, Palampur India Deptt. of Crop Improvement, Palampur, India

### [**Genetics and Molecular Basis of Heterosis in Crops**](https://whussain2.github.io/talks/2014-08-05-Genetics-and-Molecular-Basis-of-Heterosis-in-Crops)

June 03, 2009

M.Sc Seminar Talk at University SKUAST-K, Deptt. of Plant Breeding & Genetics, Srinagar, J and K, India

**Fellowships and Awards**

* Open Science Grid User School Travel Grant Award 2018.
* Travel Grant Award Kansas State Plant Breeding Symposium-2017.
* International Conference on Quantitative Genetics Fellowship Award-2016.
* Best Oral Presentation Award, UNL Plant breeding Symposium-2016.
* Indian Council of Agricultural Research (ICAR)-International Fellowship (2014-2017).
* Inspire Fellowship (Ministry of Science & Technology, Department of Science & Technology, India (2012-2104).
* University Merit Certificate (M.Sc. Plant breeding &Genetics) (2011).
* Qualified ASRB National Eligibility Test 2012, 2013 and 2014 for Assistant Professorship

**Professional Training**

* Software Carpentry Workshop on computational skills, including task automation, version control, and modular programming. Learn Bash, Git and Python. Holland Computing Center, University of Nebraska, Lincoln. August 13 & 14, 2018.
* Open Science Grid (OSG) User School 2018: Workshop on High Throughput Computing and Running Large Scale Computing Applications at University of Wisconsin Madison. July 9-13.
* Work shop Series on Unix Shell, Git and use of HCC’s High-Performance Computing, High Throughput Computing and Cloud computing resources. Holland Computing Center, University of Nebraska Lincoln. June 05-26, 2018.
* Short term bioinformatics training (RNA-seq and DNA-seq). ArrayGen Technologies, India, Pune. 23 Oct-21 Nov. 2017.
* Understanding genome-wide association studies and other big data biological applications. University of Nebraska, Lincoln. June 23-24, 2014.
* Fundamental writing skills workshop researchers. University of Nebraska, Lincoln. Sept 2015.
* Write Wining Grant Proposals, University of Nebraska, Lincoln, March 18, 2016.

**Leadership Roles**

* A representative of Department of Agronomy and Horticulture Safety Committee in the year 2015.
* Member of organizing a committee of UNL plant breeding symposium-2016.
* Hosted 2015- World Food Prize Nebraska Youth Institute in Department of Agronomy and Horticulture.
* Poster Judge (Undergraduate and Graduate) at University of Nebraska, Lincoln Spring Research Fair-2018.
* Poster Judge (Undergraduate) at ASA, CSSA Annual meetings in Baltimore, Maryland-2018.

**Professional Memberships**

* ASA, CSSA, and SSSA since June-2014.
* National Association of Plant Breeders since Feb. 2018.
* American Society of Plant Biologists since April 2018 .

**Professional Experience**

* Associate Editor: Agronomy Journal (March 2018 to present).
* Peer Reviewer: Agronomy Journal (American Society of Agronomy); PNAS, Biological Sciences, India; Physiology and Molecular Biology of Plants and Agronomy (MPDI).

**Open Source Contributions**

**ShinyAIM**: Shiny-based Application of Interactive Manhattan Plots for Longitudinal GWAS available at <https://chikudaisei.shinyapps.io/shinyaim/> and GitHub for direct download <https://github.com/whussain2/ShinyAIM>.

**Posters and Conferences**

* Lata, S., Guleria, S.K., Thakur, K., Kumari, R., Rana, M., and **Hussain, W**: Introgression of Opaque2 Gene Through Marker-Assisted Backcross Breeding in Elite Maize Inbred Lines. 13th Asian Maize Conference and Expert Consultation on Maize for Food, Feed, Nutrition and Environmental Security, Ludhiana, India October 8-10,2018. P140.
* Venegas, J.P., Graybosch, R., **Hussain, W**., Bai, G., St Amand, P., Baenziger, P.S., Blecha, S: High-Density Linkage Map Construction and Mapping of Mutant Low Phytate QTLs in Winter Wheat (Triticum Aestivum L.) Using Genotyping-By-Sequencing (GBS). ASA, CSSA and SSSA Tampa, Florida, Oct. 22-25, 2017.
* Rana, M., Verma, P., **Hussain,W**., Kaldate, R., Shikha, D., Kaachra, A., Chahota, R.K., Bhatia,S., and Sharma, T.R: Molecular Mapping of QTLs for Drought Tolerance and Yield Traits in Lentil. InterDrought-V, Hyderabad International Convention Center (HICC), At Hyderabad India, 21-25 Feb. 2017.
* Belamkar, V., Guttieri, M.J., El-Basyoni, I., **Hussain, W**., Poland, J., Jarquín, D., Lorenz, A.J., Baenziger, P.B: Translating Genomic Research into Cultivar Development in the Nebraska Wheat Program. Plant and Animal Genome Conference XXIV, San Diego, CA; 01/2017.
* Sallam, A., **Hussain, W**., Belmaker, V., and Baenziger, P.S: QTL Mapping for Traits Associated with Drought Tolerance and Combined Drought and Heat Tolerance in Seedling Winter Wheat. Plant and Animal Genome Conference, San Diego, CA; 01/2017.
* **Hussain, W**.,Stephen, P.B., Belamkar, V., Guttieri, M.J., Easterly, A., Venegas, J.P., Guedira, G.B., Poland, J: Development of High Density Linkage Map and Genome-Wide QTL Mapping for Grain Yield in Wheat Across Multiple Rainfed Environments. ASA, CSSA and SSSA Minneapolis, Nov. 6-9, 2106.
* Sallam, A., **Hussain, W**., Belmaker, V., and Baenziger, P.S: Molecular Genetic Dissection to Improve Seedling Drought Tolerance in Winter Wheat Using QTL Mapping. At: Nebraska City, USA, Conference: Plant Science Retreat-october 2016.
* Kariyawasam, G., **Hussain, W**., Easterly, A., Guttieri, M.J., Belamkar, V., Venegas, J.P., Baenziger, P.B., Poland, J., Faris, J., Xu, S., Rasmussen, J., and Liu, Z: QTL Mapping of Resistance to Tan Spot in a Winter Recombinant Inbred Line Population Derived from Cross between Harry and Wesley. Conference: American Phytopathological Society Annual Meeting-2016, At Tampa, Florida.
* **Hussain, W**., Baenziger, P.B., Belamkar, V., Guttieri, M.J., Easterly, A., Venegas, J.P., Guedira, G.B., Poland, J: SNP Discovery in Wheat RIL Population Using Genotyping-by-Sequencing and Genome-Wide QTL Mapping for Plant Height. Conference: 5th International Conference on Quantitative Genetics, At Madison, Wisconsin, USA.
* Belamkar, V., Guttieri, M.J., El-Basyoni, I., **Hussain, W**., Poland, J., Jarquín, D., Lorenz, A.J., Baenziger, P.B: Genomic Selection Shows Promise for Improving Winter Wheat: Insights from the University of Nebraska-Lincoln Wheat Breeding Program. Conference: 5th International Conference on Quantitative Genetics, At Madison, Wisconsin, USA.
* Belamkar, V., Guttieri, M.J., El-Basyoni, I., **Hussain, W**., Poland, J., Jarquín, D., Lorenz, A.J., Baenziger, P.B: Integration of Genomic Selection in the Nebraska Wheat Breeding Program. Plant and Animal Genome Conference XXIV, San Diego, CA; 01/2016.
* **Hussain, W**., Stephen, P.B, Guttieri, M.J., Easterly, A., Venegas, J.P., Guedira, G.B., Poland, J: Mapping QTLs for Plant Height Variation in RIL Population Derived from Cross Between Harry X Wesley Semi-Dwarf Wheat Lines. ASA, CSSA and SSSA Minneapolis, Nov. 15-18, 2105.

**Skills**

**Quantitative Skills**

* Genotyping-by-sequencing data analysis and SNP calling
* Trained to perfom RNA-seq data anlysis
* Quantitative Genetics
  + QTL Mapping: R/qtl, R/ASMap, IciMapping etc.
  + Genome-wide Association Mapping: Plink, TASSEL, BGLR, rrBLUP, GAPIT, FarmCPU etc.
  + Genomic Selections: BGLR, rrBLUP etc.
* Statistics
  + R
  + SAS
  + ASReml
  + Python

**Wet Lab Skills**

* DNA extractions, PCR, real-time PCR, electrophoresis, SSR marker and KASP marker genotyping

**Computational Skills**

* Operating Systems: LINUX, OS X, Windows
* Big data analysis, high-throughput and cloud computing, linux shell and git.
* Latex and R Markdown
* Perl

**Teaching Experience**

[**Teaching Experience 1**](https://whussain2.github.io/teaching/2018-ASCI%20944/STAT%20844%20Quantitative%20Methods%20for%20Genomics%20of%20Complex%20Traits)

* This lecture was one of the lectures in course **ASCI 944/STAT 844 Quantitative Methods for Genomics of Complex Traits** taught by [Dr. Gota Morota](http://morotalab.org/). In this lecture I talk about **basic concepts in GWAS**, **how to correct for population stratification**, and **statistical models to run GWAS** and also showed **practical demonstration** how to perform **GWAS in R-software**.

[**Teaching Experience 2**](https://whussain2.github.io/teaching/2018-Rclub-Lecture)

* This lecture was delivered in Rclub hosted by students in the Agronomy and Horticulture department, University of Nebraska, Lincoln. In this lecture I discussed about **data visualizations in ggplot**, **interactive visualizations using plotly**, **multiple plots in same panel**, **correlations** and **correlation heat maps**.

**References**

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