Chen-Zhu Xie

谢尘竹

Portfolio: 🕥 🕨 in

Scholar: 🕩 🎖

Preference: 6

Contact: 🔀 🛚

Personality: **(INTP)** AB

Education

Nanjing University	College of Engineering and Applied Sciences Nanjing, Jiangs							
Doctor of Philosophy	Optical Engineering	Q.E. − Top 15%	Nonlinear Fourier Optics Optics - 2025.06					
Dissertation: "Analytic 3D vector linear non-uniform & nonlinear Fourier crystal optics in arbitrary $\bar{\bar{\varepsilon}}, \bar{\bar{\chi}}$ dielectrics"								
Master 's Studies	Quantum Electronics	Courses Score – 93.5 🕠	THz OAM Source 🙃 – 2022.06					
Northeastern Unive	ersity Sch	ool of Physics, College of Scier	Shenyang, Liaoning					
Northeastern University	ersity Scho	ool of Physics, College of Scier GPA Rank – 1/400	Shenyang, Liaoning DDTank Aimbots - 2020.06					
Bachelor of Science	Applied Physics	GPA Rank − 1/400 🕥	V G ,					

Research Projects

Vector NonlinearFourier Crystal Optics

Solving
$$[(\nabla \times)^2 - k_0^2 \bar{\bar{\epsilon}} \cdot] \underline{E}(r) = k_0^2 \bar{\bar{\chi}} : \mathcal{F}_{\omega}^{-1} [\tilde{E}_{p} \tilde{E}_{p}](r)$$
 analytically 2023.05 –

- First & fastest white box solver ever for this inhomogeneous $\mathbb{C}^3_{\lambda}(\mathbb{R}^3_{\lambda})$ wave equation \circ or other similar equations, with unprecedented efficiency-accuracy product
- No competitors for the time being: other methods or software including
 k-space RK4, pseudo-spectral, SSF, Green's Function methods, FDTD, COMSOL...
- \bullet Reproduced well-known papers, all of which provide either zero or wrong theory:
 - o Nat.Photo. #proven theoratically wrong by this project #femtosecond pump
 - \circ O.E. #Bloembergen's legacy2 #experiment | O.M.E. #z-component
 - \circ O.E. | Q.E. #high N.A. # $\bar{\chi}$ anisotropy

Complex Vector Linear

Analytic
$$E(r) \in \mathbb{C}^3_{\wedge}(\mathbb{R}^3_{\wedge})$$
 to $\left[[(\nabla \times)^2 - k_0^2 \bar{\bar{\varepsilon}} \cdot] E(r) = 0 \right]$ where $\varepsilon_{ij} \in \mathbb{C}$ 2023.02 –

- Fourier Crystal Optics

 Drawing insights from PRS.A. #M.V.Berry's legacy | A.O.P. | A.P.B. | J.QSRT.
 - ullet Next generation will come really close to the exact solution with highly !hermitian $ar{ar{arepsilon}}$
 - Reproduced well-known papers, some are purely experimental (too hard to model):
 - \circ J.O.S.A. #Bloembergen's legacy1 | J.O. | O.M. | O.M. | J.O. | L.P.R.
 - \circ JOSA.A. | O.E. #tightly focus #\$\bar{e}\$ anisotropy | Light.Sci.App. | O.E.

decks <u>1</u> <u>2</u> <u>3</u> ... 😱

decks 1234 ... (7)

Real Scalar Nonlinear

Closed-form
$$E_3(\mathbf{r}) \in \mathbb{C}(\mathbb{R}^3_{\lambda})$$
 in $\left[\nabla^2 + k_3^2\right] E_3(\mathbf{r}) = -k_{03}^2 \chi(\mathbf{r}) E_1(\mathbf{r}) E_2(\mathbf{r})$ 2022.02 –

- Solving this multivariable/field nonlinear convolution equation on my own
- Strong alternative to Green's Function, pseudo-spectral, split-step Fourier methods
- Reproduced well-known papers & models with maximum accuracy & efficiency:
 - o P.R.L. #Green | P.R.L. #experiment #quantum | P.R.L. #experiment #scatter | P.R.L.
 - \circ L.P.R. #SSF #quantum | Matlab #RCWA | A.P.L. #femtosecond pump
 - o O.L. | P.R.A.

Scientific Activities

[3] The 4th Nanjing University Doctoral Interdisciplinary Innovation Forum	Nanjing, Jiangsu
"Analytic vector linear & nonlinear Fourier crystal optics in arbitrary $\bar{ar{arepsilon}}, \bar{ar{ar{\chi}}}$ dielectrics" Talk [slides]	2024.05.30
[2] 2023 CSOE-NJU ¹ Book Club Meeting & Sharing Session	Nanjing, Jiangsu
"A guided tour to Ray & Wave Optics Simulation" Talk [slides]	2023.12.09
[1] Academic Café Salon of the Research Group	Nanjing, Jiangsu
"Bi-directional notes on Nonlinear Optics in a roam-like app: RoamEdit" Talk [*.pdf]	2021.05.21

Publications

In preparation:

- [2] C. Xie and Y. Zhang, Analytic 3d vector non-uniform fourier crystal optics in arbitrary $\bar{\varepsilon}$ dielectric, (2025)
- [1] C. Xie, Y. Zhang, P. Chen, J. Guo, Q. Yu, X. Yang, M. Lv, and Y. Zhang, Nonlinear angular spectrum theory, (2025)

Journal article:

- [2] P. Chen, X. Xu, T. Wang, C. Zhou, D. Wei, J. Ma, J. Guo, X. Cui, X. Cheng, C. Xie, S. Zhang, S. Zhu, M. Xiao, and Y. Zhang, Laser nanoprinting of 3D nonlinear holograms beyond 25000 pixels-per-inch for inter-wavelength-band information processing, Nature Communications 14, 5523 (2023)
- [1] J. Guo, Y. Zhang, H. Ye, L. Wang, P. Chen, D. Mao, C. Xie, Z. Chen, X. Wu, M. Xiao, and Y. Zhang, *Spatially Structured-Mode Multiplexing Holography for High-Capacity Security Encryption*, ACS Photonics **10**, 757–763 (2023)

Software copyright:

- [4] C. Xie, Stardust DDTank charge-mode auxiliary tool.apk, [Ver 1.0], ID. 2019SR0530474, Beijing, China.
- [3] C. Xie, Stardust DDTank drag-mode auxiliary tool.exe, [Ver 1.0], ID. 2019SR0390880, Beijing, China.
- [2] C. Xie, Stardust DDTank-Browser auxiliary tool.exe, [Ver 1.0], ID. 2019SR0435497, Beijing, China.
- [1] C. Xie, Stardust DDTank-mobile auxiliary tool.exe, [Ver 1.0], ID. 2019SR0390310, Beijing, China.

Academic Focus

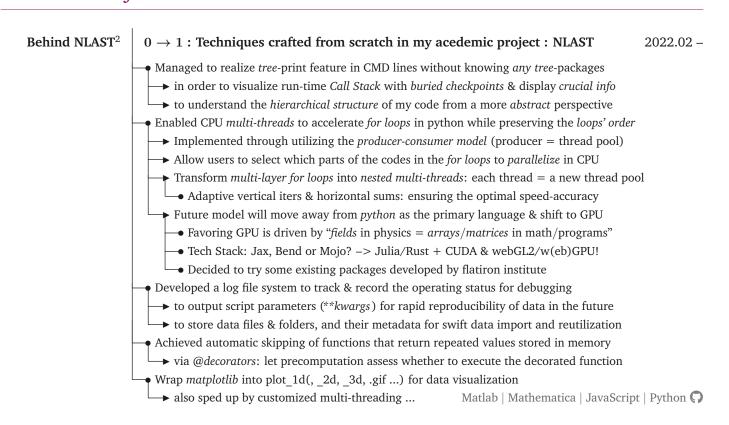
Next generation high N.A. 3D vector non-uniform analytic line	ear & nonlinear Fourier crystal optics 🗘 2024.	.06 –
!Paraxial k_0^{ω} High N.A. 3D vector non-uniform analytic line	• • • •	
• •	ear & nonlinear Fourier crystal optics (2023.	
1 0 11,72	ear & nonlinear Fourier crystal optics (2023)	
	ear & nonlinear Fourier crystal optics (2023)	
-	ear & nonlinear Fourier crystal optics (2022)	
a (a 2 a a 2	ear angular spectrum theory for SFG 2022.	
2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		
Solution $\mathcal{F}[E_3] = \iiint \cdot \text{to} \left(\nabla^2 + k_3^2 \right) E_3(r) \propto P_3^{(2)}(r)$ No	onlinear convolution solution to SFG 😱 2022.	.03 –

¹The Nanjing University student branch of the Chinese Society for Optical Engineering

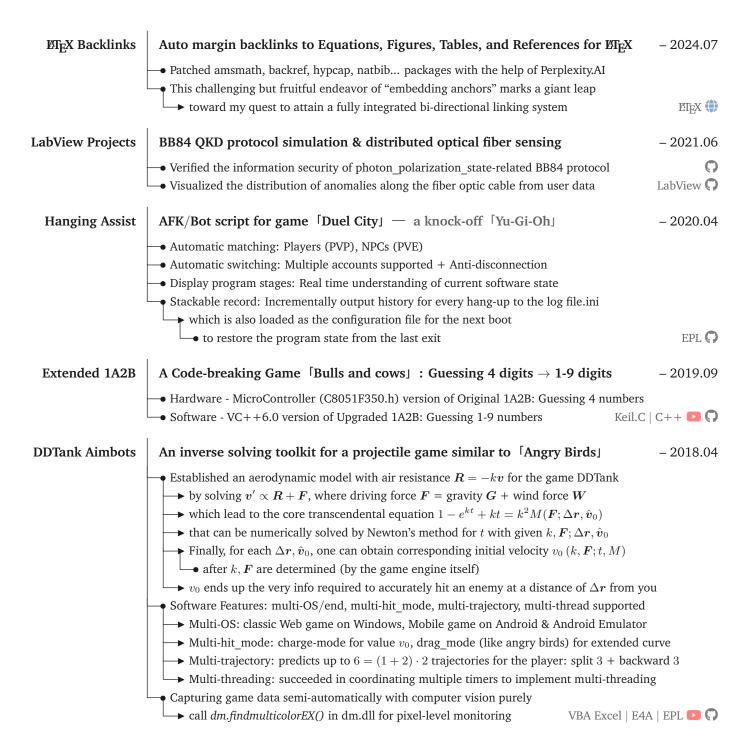
Honors & Awards

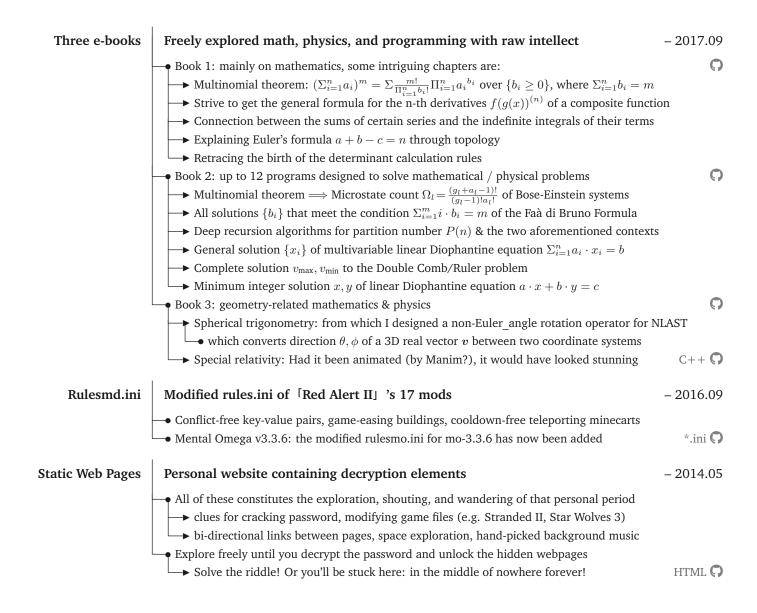
	Doctoral Interdisciplinary Forum (Oral)	2nd place	0	¥1,000	Nanjing	II	2024.05
Academia			Excellent Excellent	()	Top 15%	Nanjing	U.	
	Bachelar Thesis 🕠 & Defense		Excellent	0	1/90	Northeastern	U.	2020.06
	NJU 1st Most Beautiful Notes Comp.	(2nd place		¥500	Nanjing	U.	2024.09
Competition	Three Provinces Achievement Expo	(Exhibition	0	Leader	Three 1	Prov.	2019.10
	"Challenge Cup" Tech Competition	(Grand prize	0	Leader	Liaoning l	Prov.	2019.06
Scholarships	Academic Fellowship		1st class		¥40,000	Nanjing	U.	2020-24
•	"Jinchuan" Scholarship		1st place		¥5,000	Northeastern	U.	2019.04
&	Academic Scholarship		1st place		¥2,000	Northeastern	U.	2018.06
Fellowships	Entrance Scholarship		3rd place		¥5,000	Leshan No.1	H.S.	2013.09
Honors	Graduation with Honor	(Outstanding	g		Northeastern	U.	2020.07
&	League Member	(Excellent	0		Northeastern	U.	2019.11
Titles	Undergraduate Student		Excellent	0		Northeastern	U.	2018.12
20 1 1:	Chinese Society for Optical Engineering	g	Member			Nanjing	U.	2021-25
Memberships	"Qian Sanqiang" Talent Class		Head			I.H.E.P.		2017-20

Personal Projects



²Non-linear Angular Spectrum Theory (= Nonlinear Fourier Optics in Research Projects)





Historical Details

Doctoral -	Activities Academ	mia 🗘 🗣 24 – 27 🕓	2022.09 – 2025.06
Postgraduate -•	Activities C Courses Academ	mia 🗘 •- 22 – 24 🕒	2020.09 - 2022.06
Undergraduate -•	Activities 🗘 Courses 🗘	•- 18 - 22 ♥	2016.09 – 2020.06
Senior-high-school -	Activities 🔾	•- 15 – 18 ()	2013.09 - 2016.06