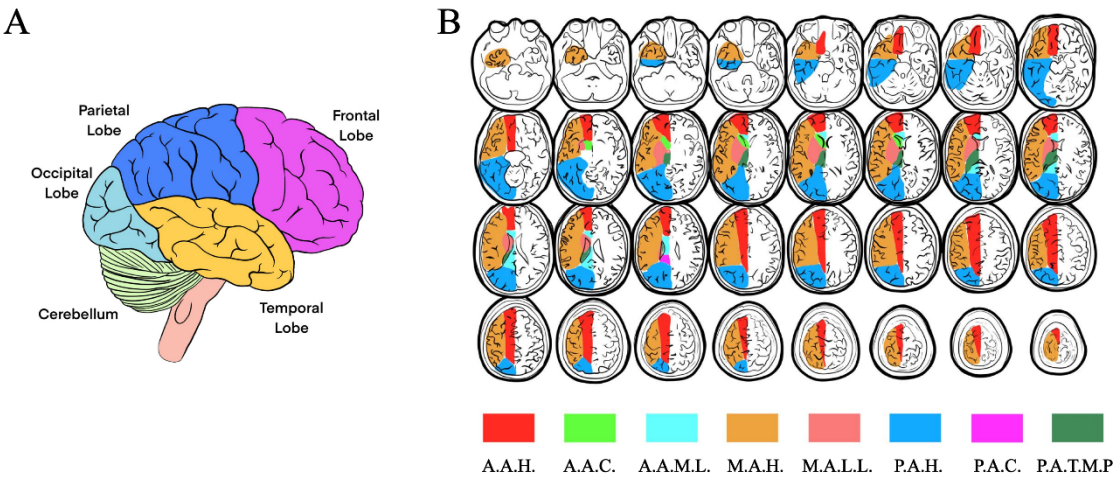

Figure S1 Schematic representation of (A) different lobes and (B) arterial regions in the white matter hyperintensity extraction section. It is worth noting that the panel B is a cartoon drawing with reference to Reference 1 (50). AAH, anterior artery hemisphere; AAC, anterior artery callosal; AAML, anterior artery medial lenticulostriate; MAH, middle artery hemisphere; MALL, middle artery lateral lenticulostriate, PAH, posterior artery hemisphere; PAC, posterior artery callosal; PATMP, posterior artery thalamic and midbrain perforators.

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Table S1 The 82 paired neighboring gyri name were generated by using the Destrieux atlas (54)

No.	FreeSurfer-based nomenclature	FreeSurfer label number
1	ctx_lh_G_front_middle---ctx_lh_G_front_middle	11,115: 11,115
2	ctx_lh_G_front_sup---ctx_lh_G_and_S_cingul-Ant	11,116: 11,106
3	ctx_lh_G_front_sup---ctx_lh_G_front_middle	11,116: 11,115
4	ctx_lh_G_front_sup---ctx_lh_G_front_sup	11,116: 11,116
5	ctx_lh_G_precentral---ctx_lh_G_postcentral	11129: 11,128
6	ctx_lh_G_precentral---ctx_lh_G_precentral	11,129: 11,129
7	ctx_lh_S_central---ctx_lh_G_precentral	11,146: 11,129
8	ctx_lh_S_central---ctx_lh_S_central	11,146: 11,146
9	ctx_lh_S_front_inf---ctx_lh_G_front_middle	11,153: 11,115
10	ctx_lh_S_front_inf---ctx_lh_S_front_inf	11,153: 11,153
11	ctx_lh_S_front_middle---ctx_lh_G_front_middle	11,154: 11,115
12	ctx_lh_S_front_sup---ctx_lh_G_front_middle	11,155: 11,115
13	ctx_lh_S_front_sup---ctx_lh_G_front_sup	11,155: 11,116
14	ctx_lh_S_front_sup---ctx_lh_S_front_sup	11,155: 11,155
15	ctx_lh_S_orbital-H_Shaped---ctx_lh_S_orbital-H_Shaped	11,165: 11,165
16	ctx_lh_S_pericallosal---ctx_lh_G_front_sup	11,167: 11,116
17	ctx_lh_S_precentral-inf-part---ctx_lh_S_front_inf	11,169: 11,153
18	ctx_lh_S_precentral-inf-part---ctx_lh_S_precentral-inf-part	11,169: 11,169
19	ctx_lh_S_precentral-sup-part---ctx_lh_G_precentral	11,170: 11,129
20	ctx_lh_S_precentral-sup-part---ctx_lh_S_precentral-sup-part	11,170: 11,170
21	ctx_rh_G_front_middle---ctx_rh_G_front_middle	12,115: 12,115
22	ctx_rh_G_front_sup---ctx_rh_G_and_S_cingul-Ant	12,116: 12,106
23	ctx_rh_G_front_sup---ctx_rh_G_front_middle	12,116: 12,115
24	ctx_rh_G_front_sup---ctx_rh_G_front_sup	12,116: 12,116
25	ctx_rh_G_orbital---ctx_rh_G_orbital	12,124: 12,124
26	ctx_rh_G_precentral---ctx_rh_G_precentral	12,129: 12,129
27	ctx_rh_S_central---ctx_rh_G_precentral	12,146: 12,129
28	ctx_rh_S_front_inf---ctx_rh_G_front_middle	12,153: 12,115
29	ctx_rh_S_front_inf---ctx_rh_S_front_inf	12,153: 12,153
30	ctx_rh_S_front_middle---ctx_rh_G_front_middle	12,154: 12,115
31	ctx_rh_S_front_middle---ctx_rh_S_front_middle	12,154: 12,154
32	ctx_rh_S_front_sup---ctx_rh_G_front_middle	12,155: 12,115
33	ctx_rh_S_front_sup---ctx_rh_G_front_sup	12,155: 12,116
34	ctx_rh_S_front_sup---ctx_rh_S_front_sup	12,155: 12,155
35	ctx_rh_S_orbital-H_Shaped---ctx_rh_G_orbital	12,165: 12,124
36	ctx_rh_G_and_S_cingul-Mid-Post--ctx_rh_G_front_sup	12108: 12116
37	ctx_rh_S_precentral-inf-part---ctx_rh_S_front_inf	12,169: 12,153
38	ctx_rh_S_precentral-inf-part---ctx_rh_S_precentral-inf-part	12,169: 12,169
39	ctx_rh_S_precentral-sup-part---ctx_rh_G_precentral	12,170: 12,129
40	ctx_rh_S_precentral-sup-part---ctx_rh_S_precentral-sup-part	12,170: 12170
41	ctx_lh_G_pariet_inf-Angular---ctx_lh_G_pariet_inf-Angular	11,125: 11,125
42	ctx_lh_G_pariet_inf-Supramar---ctx_lh_G_pariet_inf-Supramar	11,126: 11,126
43	ctx_lh_G_parietal_sup---ctx_lh_G_parietal_sup	11,127: 11,127
44	ctx_lh_G_postcentral---ctx_lh_G_postcentral	11,128: 11,128
45	ctx_lh_S_intrapariet_and_P_trans---ctx_lh_G_pariet_inf-Angular	11,157: 11,125
46	ctx_lh_S_intrapariet_and_P_trans---ctx_lh_G_parietal_sup	11,157: 11,127
47	ctx_lh_S_intrapariet_and_P_trans---ctx_lh_S_intrapariet_and_P_trans	11,157: 11,157
48	ctx_lh_S_postcentral---ctx_lh_G_postcentral	11,168: 11,128
49	ctx_lh_S_postcentral---ctx_lh_S_postcentral	11,168: 11,168
50	ctx_rh_G_pariet_inf-Angular---ctx_rh_G_pariet_inf-Angular	12,125: 12,125
51	ctx_rh_G_pariet_inf-Supramar---ctx_rh_G_pariet_inf-Supramar	12,126: 12,126
52	ctx_rh_G_parietal_sup---ctx_rh_G_parietal_sup	12,127: 12,127
53	ctx_rh_Lat_Fis-post---ctx_rh_G_pariet_inf-Supramar	12,141: 12,126
54	ctx_rh_S_central---ctx_rh_S_central	12,146: 12,146
55	ctx_rh_S_intrapariet_and_P_trans---ctx_rh_G_pariet_inf-Angular	12,157: 12,125
56	ctx_rh_S_intrapariet_and_P_trans---ctx_rh_G_parietal_sup	12,157: 12,127
57	ctx_rh_S_intrapariet_and_P_trans---ctx_rh_S_intrapariet_and_P_trans	12,157: 12,157
58	ctx_rh_S_parieto_occipital---ctx_rh_S_parieto_occipital	12,166: 12,166
59	ctx_rh_S_postcentral---ctx_rh_G_postcentral	12,168: 12,128
60	ctx_rh_S_postcentral---ctx_rh_S_intrapariet_and_P_trans	12,168: 12,157
61	ctx_rh_S_postcentral---ctx_rh_S_postcentral	12,168: 12,168
62	ctx_lh_G_oc-temp_med-Lingual---ctx_lh_G_oc-temp_med-Lingual	11,122: 11,122
63	ctx_lh_S_oc_middle_and_Lunatus---ctx_lh_G_occipital_middle	11,158: 11,119
64	ctx_lh_S_oc_sup_and_transversal---ctx_lh_S_oc_sup_and_transversal	11,159: 11,159
65	ctx_lh_S_parieto_occipital---ctx_lh_S_parieto_occipital	11,166: 11,166
66	ctx_rh_G_cuneus---ctx_rh_G_cuneus	12,111: 12,111
67	ctx_rh_G_occipital_middle---ctx_rh_G_occipital_middle	12,119: 12,119
68	ctx_rh_G_oc-temp_med-Lingual---ctx_rh_G_oc-temp_med-Lingual	12,122: 12,122
69	ctx_rh_Pole_occipital---ctx_rh_Pole_occipital	12,143: 12,143
70	ctx_rh_S_oc_middle_and_Lunatus---ctx_rh_G_occipital_middle	12,158: 12,119
71	ctx_rh_S_oc_sup_and_transversal---ctx_rh_G_occipital_sup	12,159: 12,120
72	ctx_rh_S_oc_sup_and_transversal---ctx_rh_S_oc_sup_and_transversal	12,1259: 12,159
73	ctx_lh_S_temporal_sup---ctx_lh_G_pariet_inf-Angular	11,174: 11,125
74	ctx_lh_S_temporal_sup---ctx_lh_G_temporal_middle	11,174: 11,138
75	ctx_lh_S_temporal_sup---ctx_lh_S_temporal_sup	11,174: 11,174
76	ctx_rh_G_temporal_middle---ctx_rh_G_temporal_middle	12,138: 12,138
77	ctx_rh_Lat_Fis-post---ctx_rh_Lat_Fis-post	12,141: 12,141
78	ctx_rh_S_temporal_sup---ctx_rh_G_pariet_inf-Angular	12,174: 12,125
79	ctx_rh_S_temporal_sup---ctx_rh_G_temporal_middle	12,174: 12,138
80	ctx_rh_S_temporal_sup---ctx_rh_S_temporal_sup	12,174: 12,174
81	ctx_lh_G_and_S_cingul-Ant---ctx_lh_G_and_S_cingul-Ant	11,106: 11,106
82	ctx_rh_G_and_S_cingul-Ant---ctx_rh_G_and_S_cingul-Ant	12,106: 12,106

https://dx.doi.org/10.21037/qims-23-847

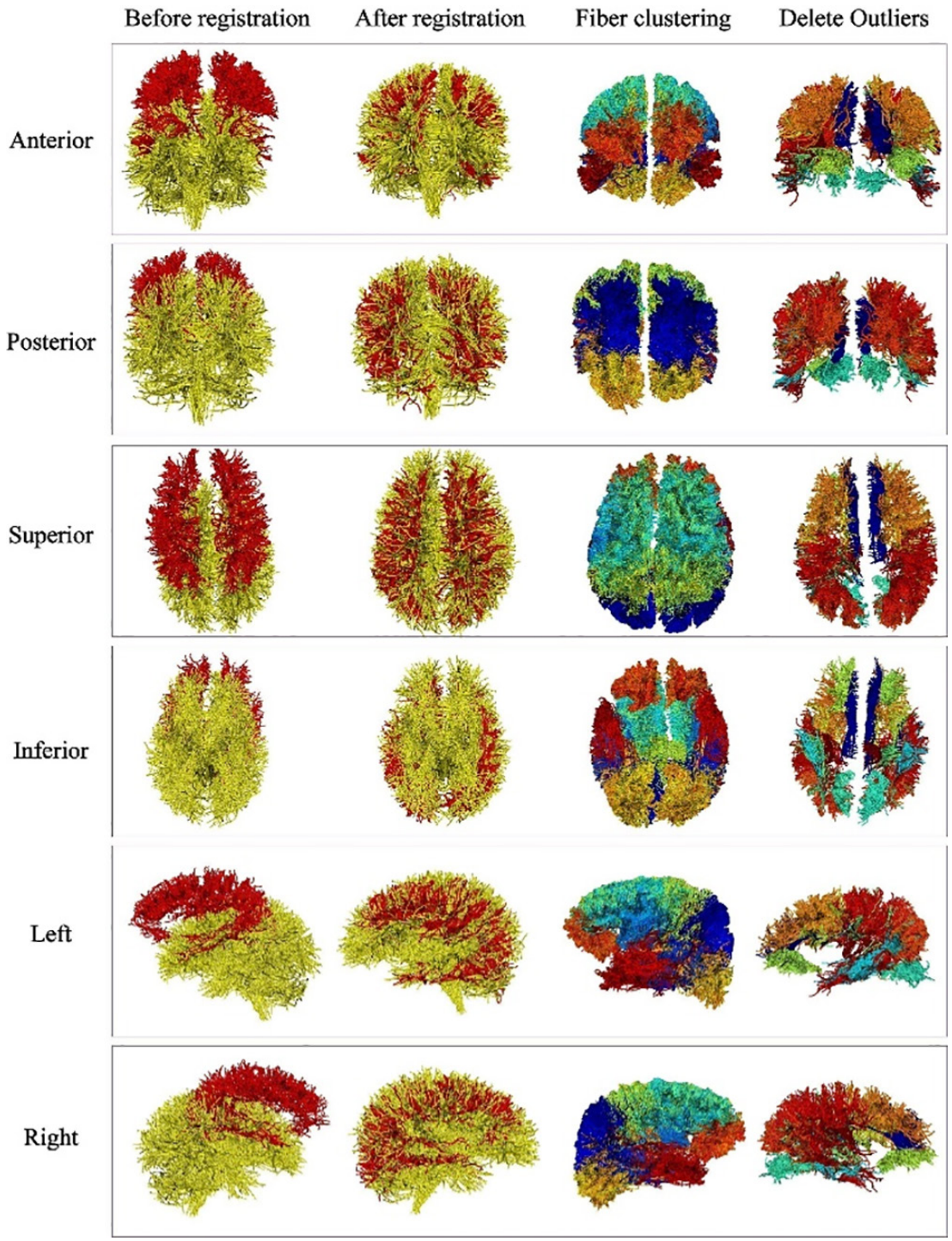

Figure S2 Visualization of U-fibers clustering from different views (anterior, posterior, superior, inferior, left, right). The U-fiber clustering process included the (I) registration of the white matter tractography to the atlas; (II) fiber clustering; and (III) outliers deleted.

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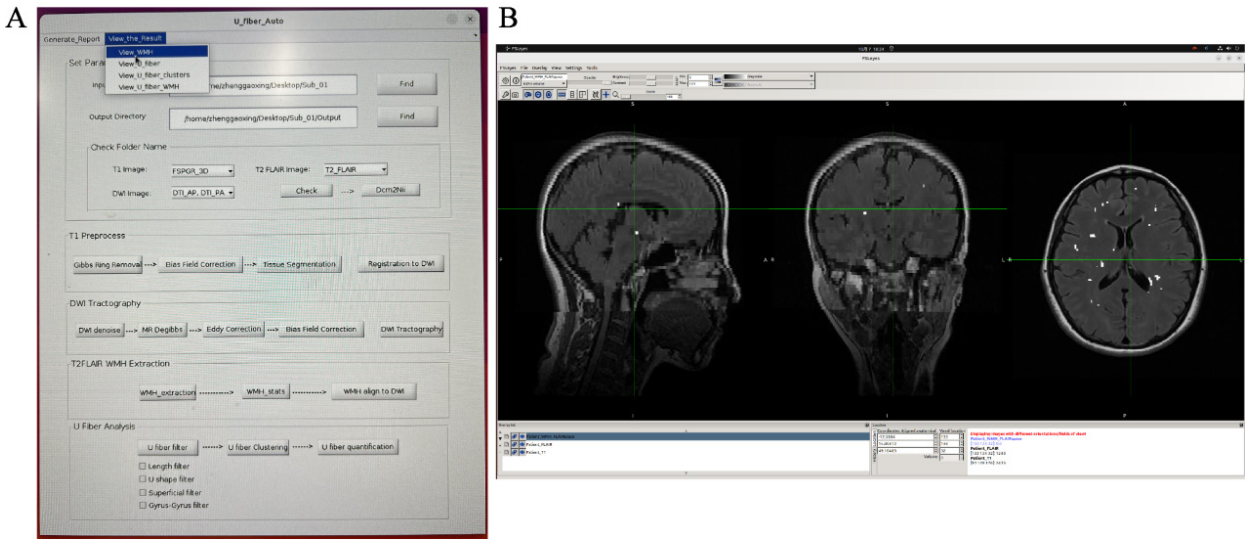

Figure S3 WMHs visualization module provided by UFA toolbox. (A) Shows the interface of the UFA toolbox, where the menu bar "View_the_Result" is the visualization module of UFA, and the drop-down menu "View_WMH" is the visualization module of WMHs, and the results in Figure B can be obtained by clicking "View_WMH"; (B) shows the WMHs extraction results of a subject, where the white dots indicate the automatically extracted WMHs. WMHs, white matter hyperintensities.

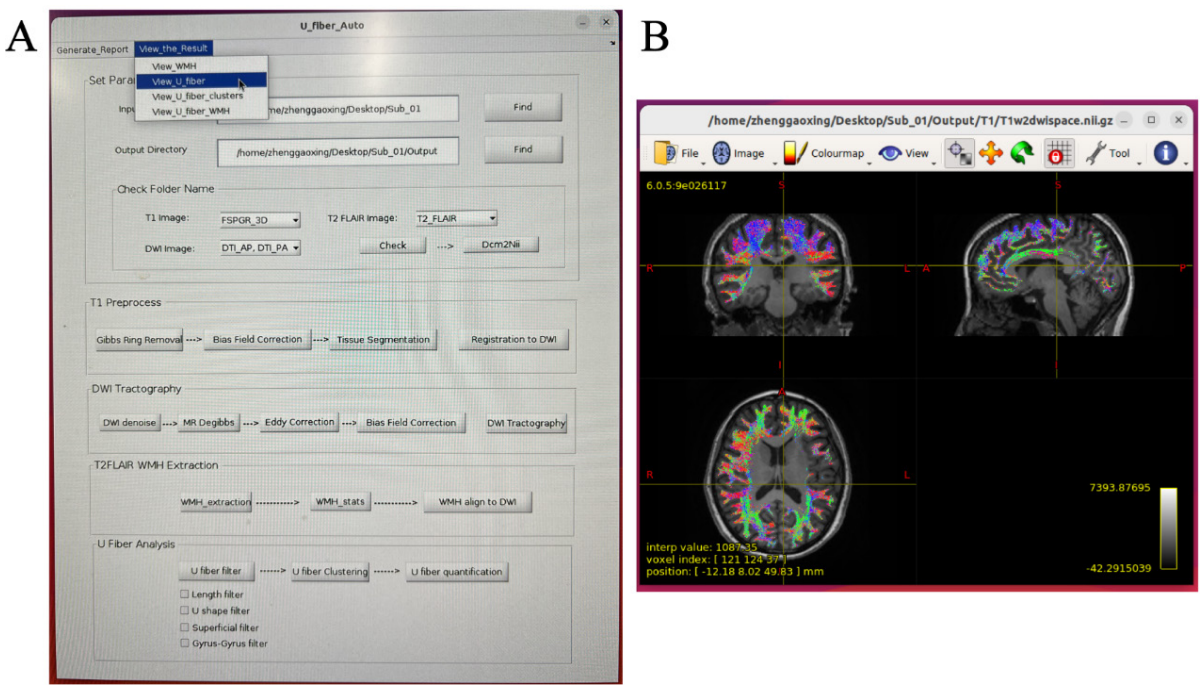

Figure S4 U-fibers visualization module provided by UFA toolbox.

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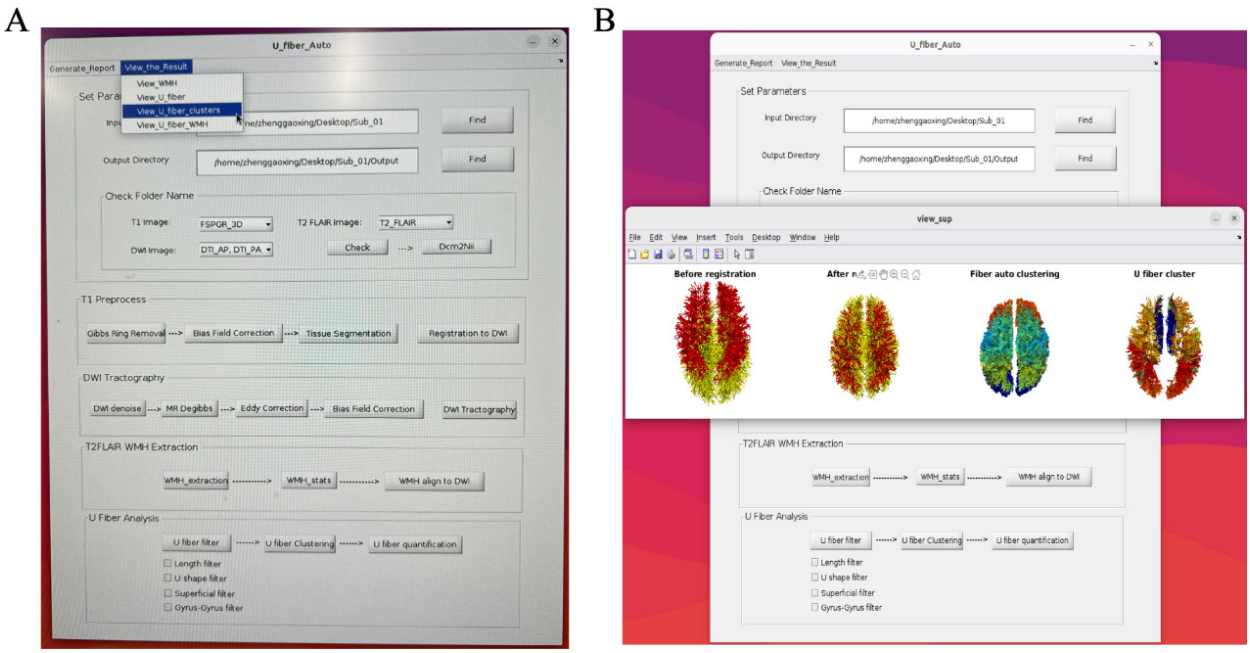

Figure S5 U-fiber clusters visualization module provided by UFA toolbox.

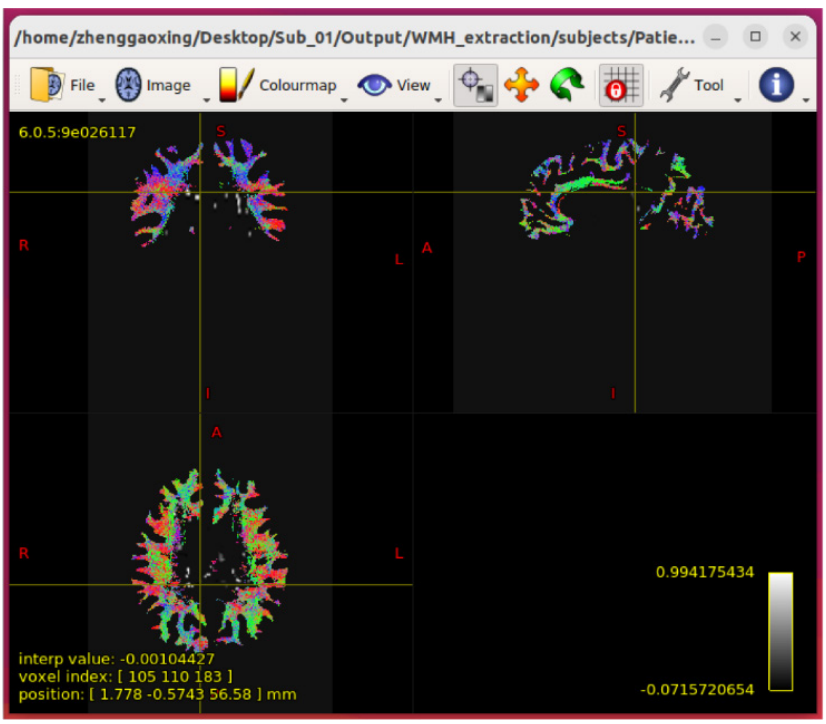

Figure S6 Visualization of WMHs and U-fibers overlapping together. The colored part is U-fibers, and the white dots are WMHs. Users can slide the mouse to see whether WMHs of different layers are attached to U-fibers. WMHs, white matter hyperintensities.

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Figure S7 Neuroimaging analysis report automatically generated by the UFA toolbox. The title of the report is "The multi-modal neuroimaging report", and the first part is the basic information of the patient, such as "Name", "ID", "Gender", "Age", "Weight (kg)", "Birth Date", "Scan Time", "Modality". The second part is the volume and number of WMHs in different brain regions, including whole brain, PV and deep brain, as well as different brain lobes and arteries. The third part is the U-fiber quantification characteristics, including the number of the U-fiber, mean U-fiber length and the microstructural characteristics (AD/FA/MD/RD) of the U-fibers. WMHs, white matter hyperintensities; PV, periventricular; L, left hemisphere; R, right hemisphere; AAH, anterior artery hemisphere; AAC, anterior artery callosal; AAML, anterior artery medial lenticulostriate; MAH, middle artery hemisphere; MALL, middle artery lateral lenticulostriate, PAH, posterior artery hemisphere; PAC, posterior artery callosal; PATMP, posterior artery thalamic and midbrain perforators; FA, fractional anisotropy; MD, mean diffusivity; AD, axial diffusivity; RD, radial diffusivity; Sup-FP, superficial-frontal-parietal; Sup-F, superficial-frontal; Sup-OT, superficial-occipital-temporal; Sup-O, superficial-occipital; Sup-PO, superficial-parietal-occipital; Sup-PT, superficial-parietal-temporal; Sup-P, superficial-parietal; Sup-T, superficial-temporal.

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