

Skill Distance Between Occupations and Post-Training Professional Transitions of Jobseekers

Kevin Michael Frick, Yagan Hazard, Damien Mayaux and Thomas Zuber

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S1 – Year-By-Year Descriptive Statistics of the Job-Posting Database Used

		2018 (N=184,268)		2019 (N=3,038,218)		2020 (N=17,440,056)	
		Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Nb. of characters		584.3	292.4	583.1	291.1	614.5	295.0
		N	Pct.	N	Pct.	N	Pct.
Month	01	0	0.0	261,816	8.6	260,258	14.9
	02	0	0.0	248,474	8.2	237,635	13.6
	03	0	0.0	281,139	9.3	152,299	8.7
	04	0	0.0	277,224	9.1	75,146	4.3
	05	0	0.0	279,569	9.2	116,114	6.7
	06	0	0.0	259,258	8.5	200,104	11.6
	07	0	0.0	277,008	9.1	196,564	11.3
	08	0	0.0	223,089	7.3	172,168	9.9
	09	0	0.0	275,109	9.1	235,763	13.5
	10	0	0.0	255,567	8.4	98,005	5.6
	11	0	0.0	212,388	7.0	0	0.0
	12	184,268	100.0	187,577	6.2	0	0.0
Industry	Agriculture, fishing, natural spaces	3,269	1.8	67,567	2.2	44,158	2.5
	Arts, artworks	272	0.1	5,002	0.2	3,354	0.2
	Banking, insurance, real estate	3,673	2.0	56,048	1.8	34,611	2.0
	Business support	22,662	12.3	347,361	11.4	184,154	10.6
	Retail	28,483	15.5	525,095	17.3	268,482	15.4
	Communication, media	1,120	0.6	24,378	0.8	11,142	0.6
	Construction	17,681	9.6	303,122	10.0	190,339	10.9
	Entertainment	310	0.2	4,784	0.2	2,344	0.1
	Health	7,995	4.3	131,517	4.3	106,988	6.1
	Hospitality, catering, tourism	17,180	9.3	350,466	11.5	187,878	10.8
	Industrial production	17,659	9.6	258,06	8.5	131,373	7.5
	Installation., maintenance	13,084	7.1	206,269	6.8	131,414	7.5
	Personal and community services	36,129	19.6	515,103	17.0	311,638	17.9
	Transport	14,751	8.0	243,410	8.0	136,181	7.8
Type	Fixed term	51,626	28.0	896,966	29.5	566,720	32.5
	Permanent	90,244	49.0	1,489,508	49.0	795,680	45.6
	Temporary	35,315	19.2	505,909	16.7	280,141	16.1
	Other	7,083	3.8	145,835	4.8	101,515	5.8

S2 – Visualizing the Relative Positioning of Occupations in the Neighborhood of a Few Representative Occupations

We also developed a visualization methodology for the spatial representation of occupations that makes it possible to illustrate the norm and the relative positioning of occupations in the neighborhood of a reference occupation. To visualize a 20-dimensional space, one generally uses dimensionality-reduction methods such as principal component analysis. However, the particular geometry of our representation contains a lot of information that we might lose if we were to project a cloud of points directly from dimension 20 to dimension 2. To address this, we choose a reference occupation whose neighborhood we wish to display,

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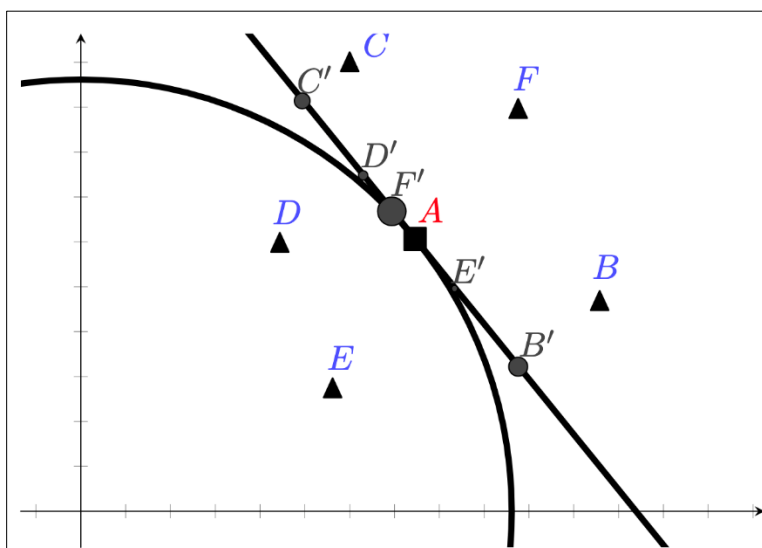
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then (1) we project nearby occupations onto the tangent hyperplane to the sphere centered at the origin passing through the reference point, after which (2) we apply principal component analysis to the resulting projection. Finally, we reincorporate into the figure the information about the “lost” norm during projection onto the tangent hyperplane by adjusting the size of the plotted points according to the norm of the corresponding vector.

Figure S2-1 illustrates the procedure used to construct the visualization. The red square A represents the reference occupation and the blue triangles B , C , D , E , and F its closest neighbors. The blue points are projected onto the tangent hyperplane at A to form the gray circles B' , C' , D' , E' , and F' (1). Note that the sizes of the gray circles vary with the norm of the original vector. The scale of the drawing does not allow us to depict the effect of principal component analysis (2), but one should keep in mind that it is applied to the gray points and we choose to center it on point A .

Figure S2-1 – The visualization method used



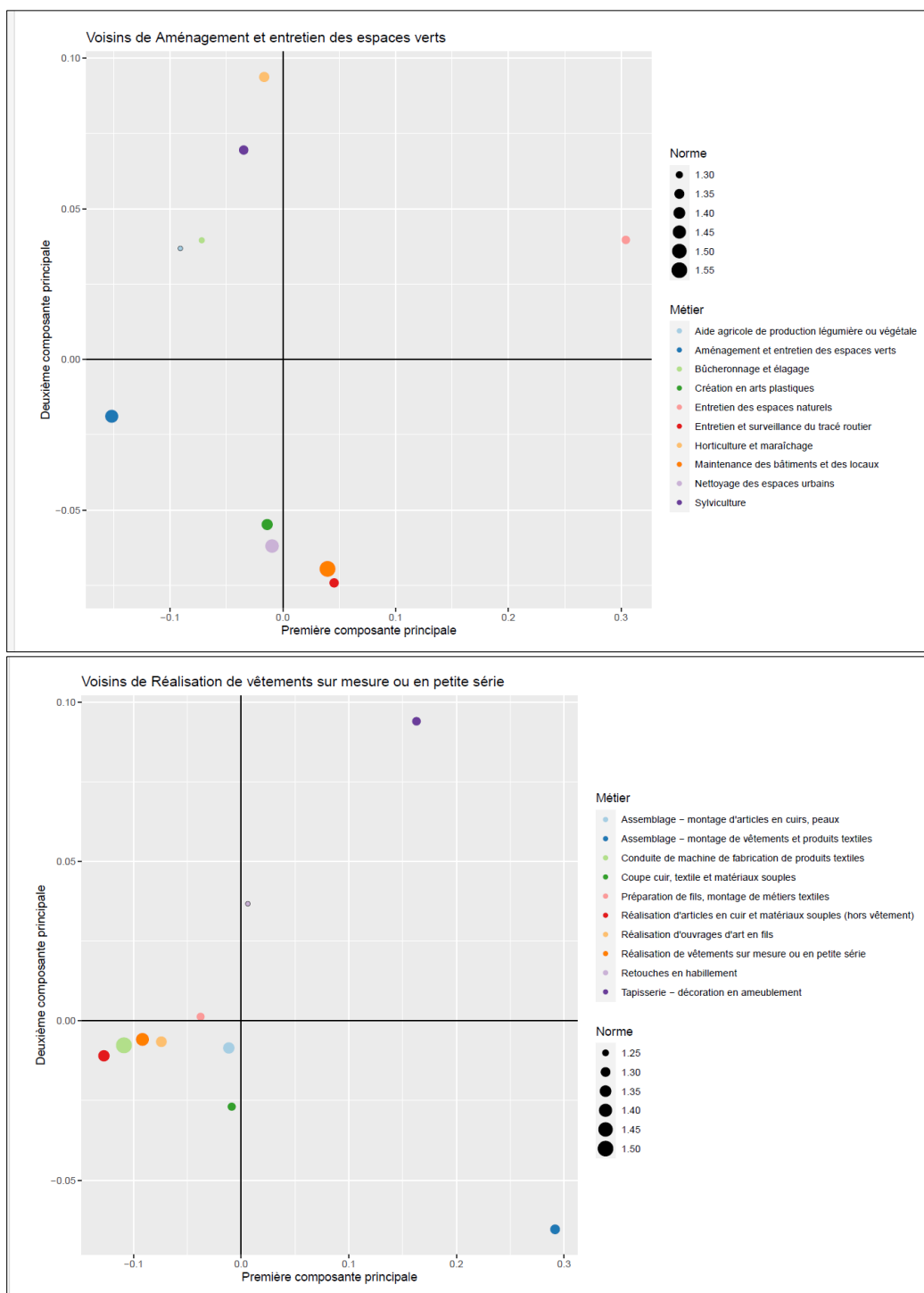
Notes: To visualize in the skill space the nearest neighbors B , C , D , E , and F of a given occupation A , we first (1) project them onto the tangent hyperplane to the sphere centered at the origin with radius equal to the norm of A to form B' , C' , D' , E' , and F' ; then (2) apply principal component analysis to reduce the dimension; and finally (3) enlarge the point corresponding to each occupation according to its initial norm.

We use this method to illustrate one of the representative occupations discussed earlier and its closest neighbors. It enables qualitative exploration of the spatial representation, in particular by checking that the relative norms of the occupations appear coherent and that the directions in which the neighbors of a given occupation deviate can be interpreted. In the future, this mode of representation could be used to observe how the representative $F(t)$ of a job posting t moves when its text is slightly changed.

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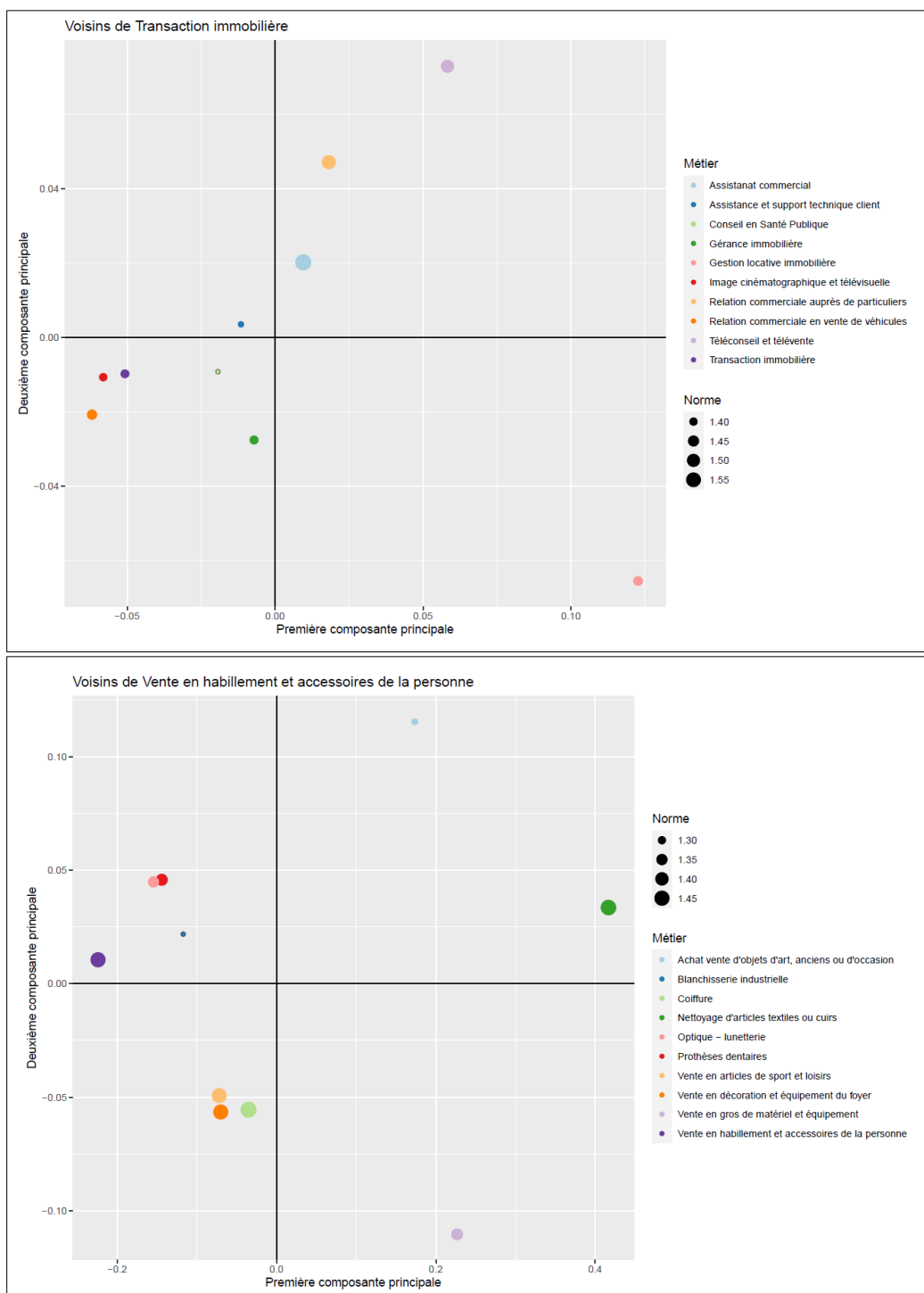
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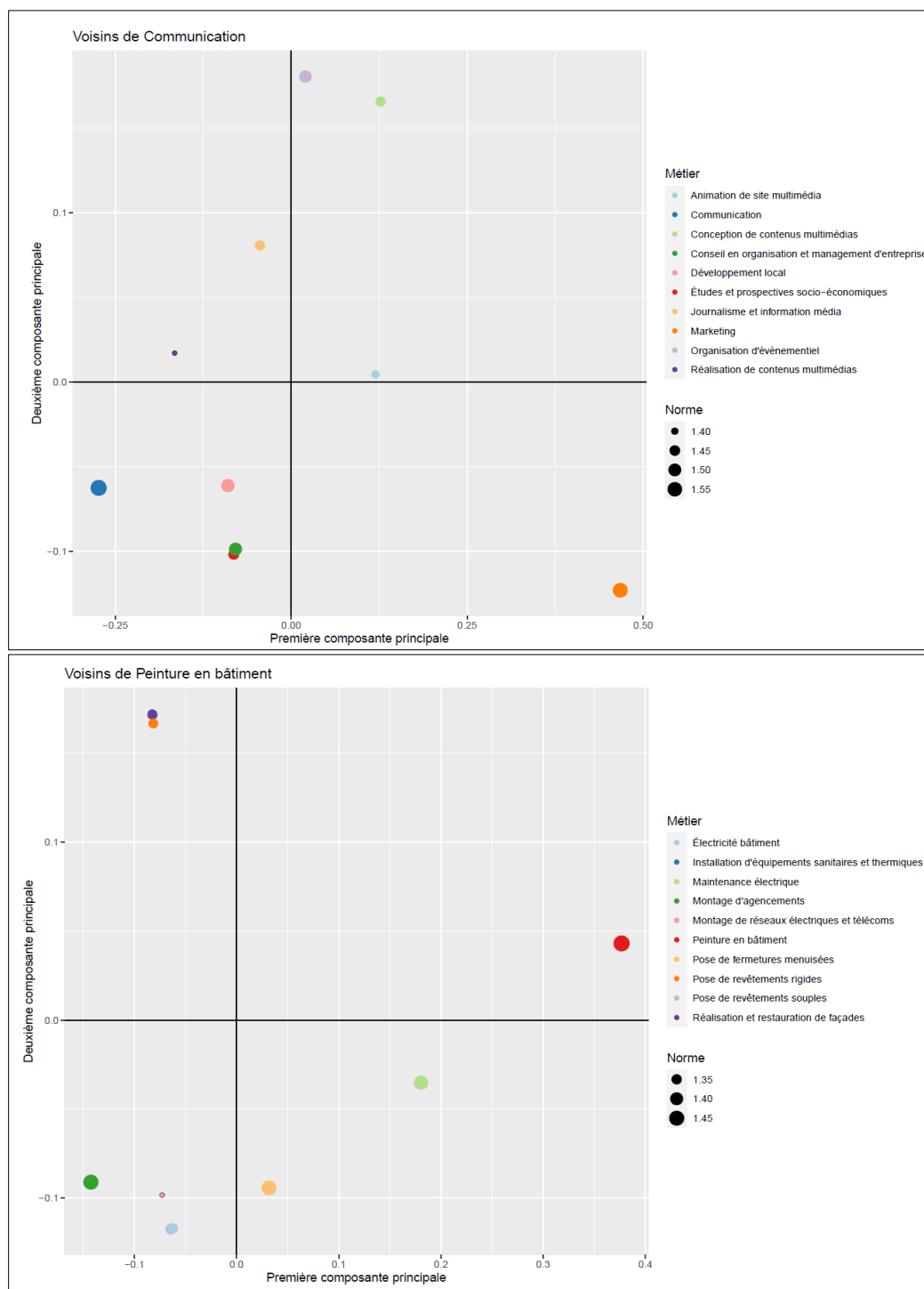
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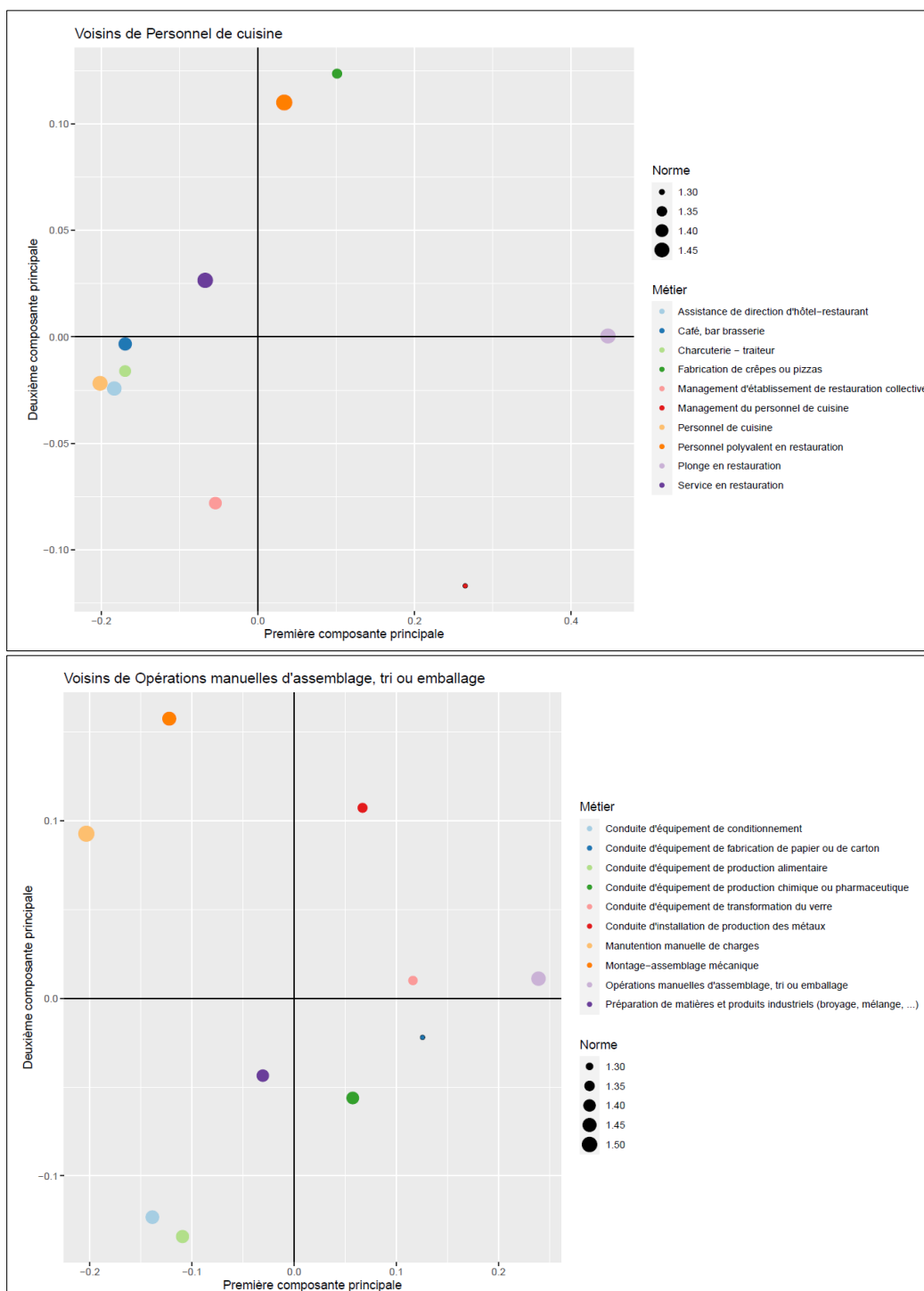
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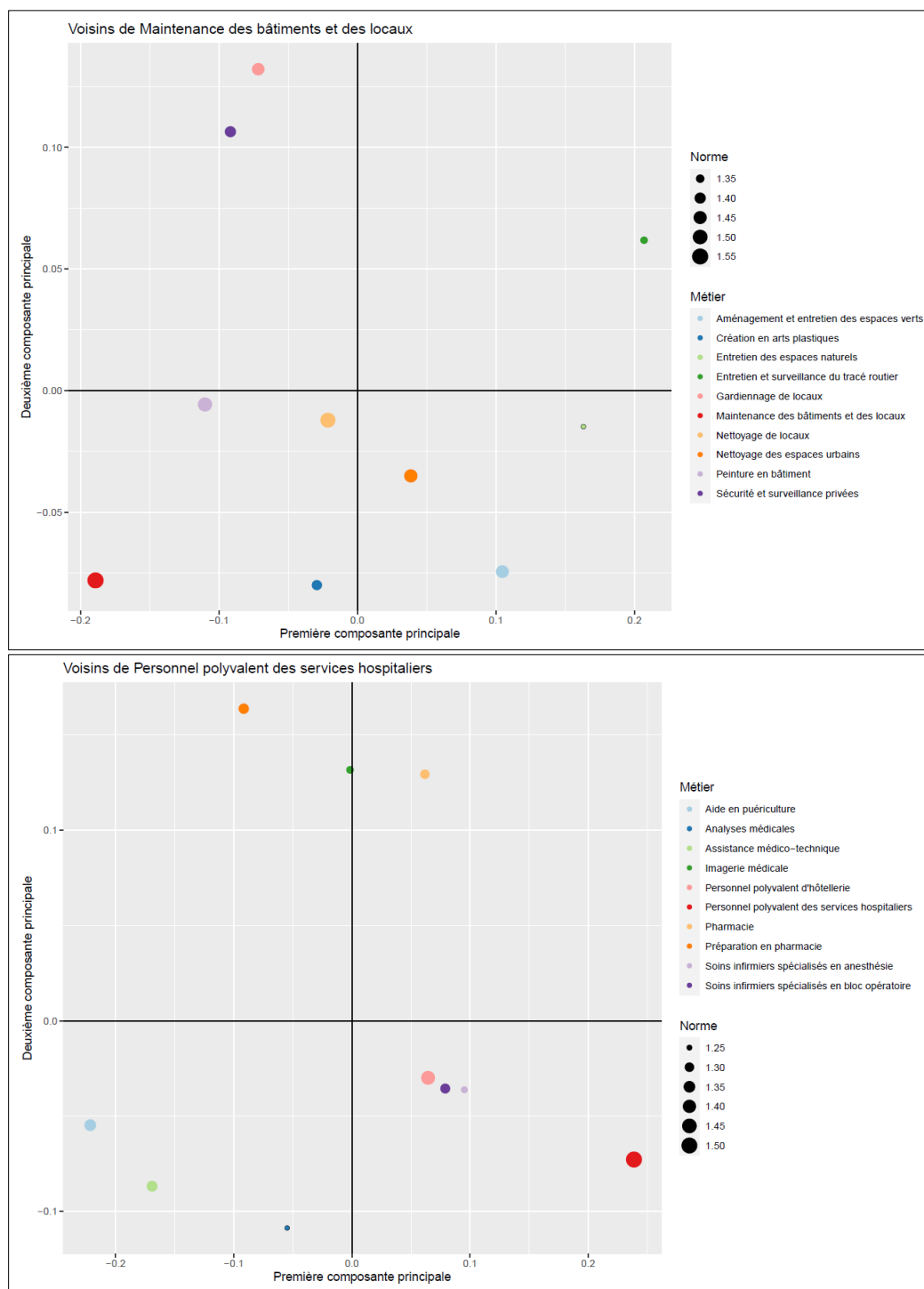
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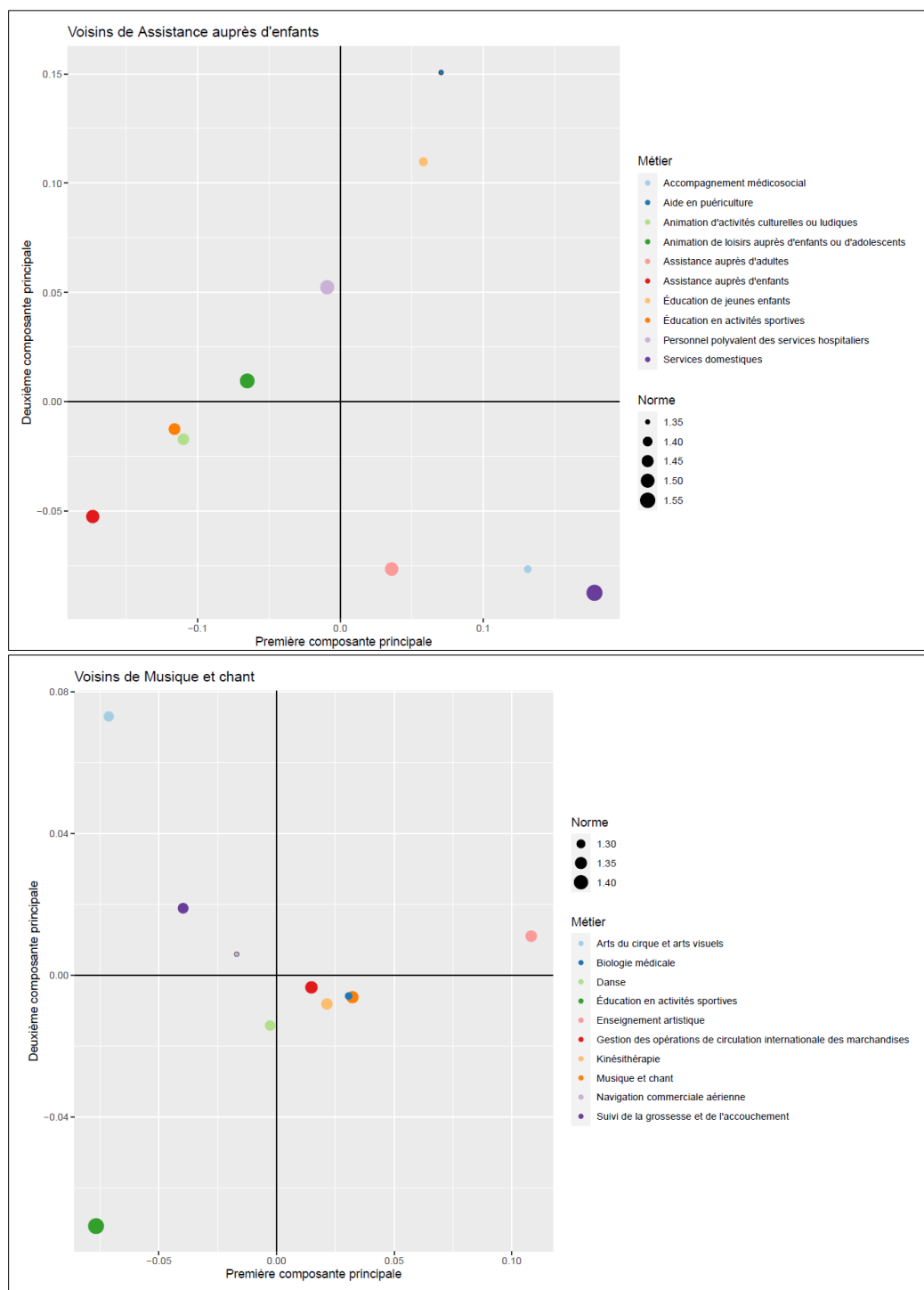
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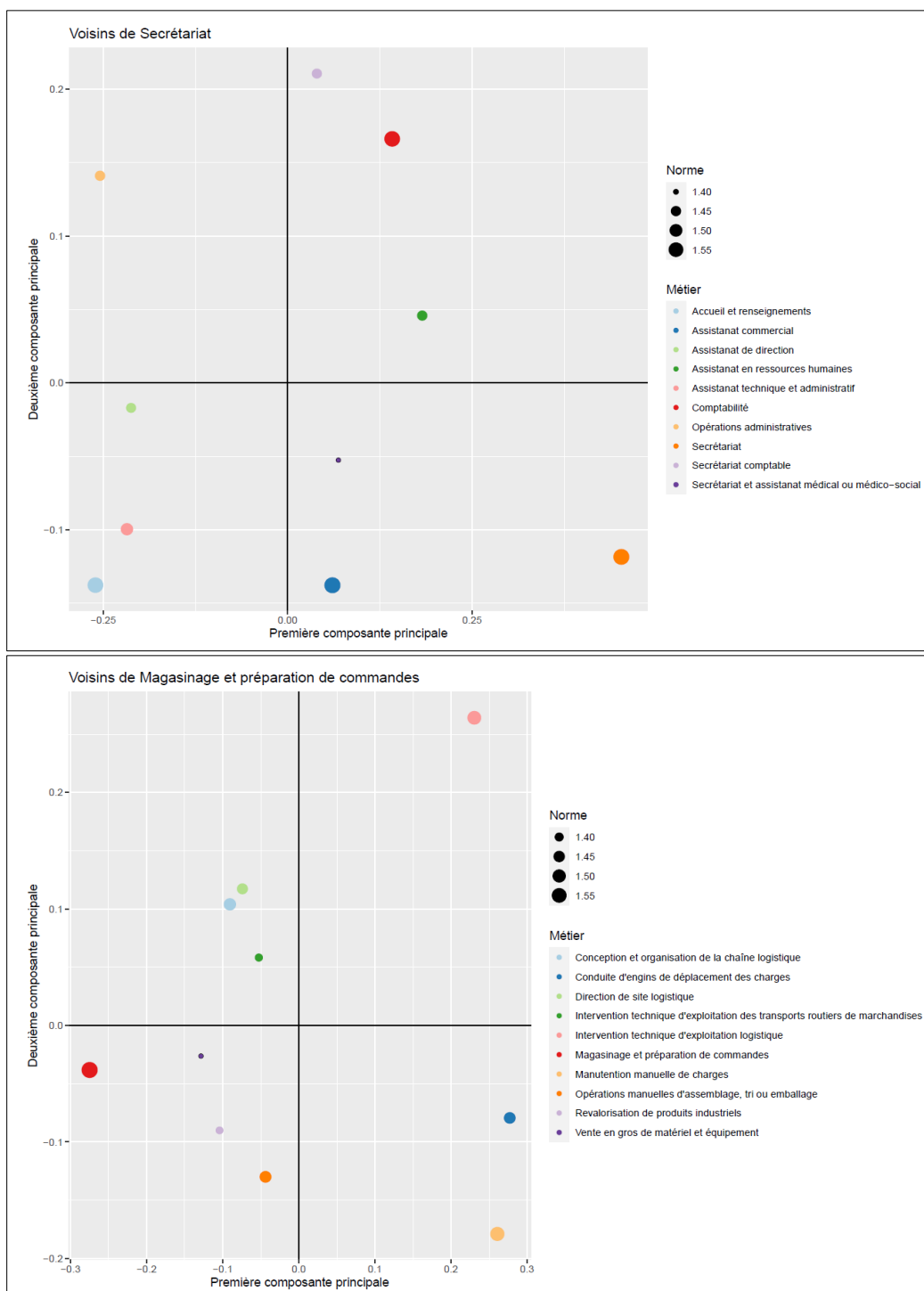
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S3 – Notre distance appliquée aux mobilités présentes dans ROME V3

From Aménagement et entretien des espaces verts, code A1203

- Entretien des espaces naturels, $d = 0.248$, rank 2
- Horticulture et maraîchage, $d = 0.440$, rank 4
- Sylviculture, $d = 0.467$, rank 7
- Vente de végétaux, $d = 0.656$, rank 80
- Arboriculture et viticulture, $d = 0.683$, rank 119
- Formation professionnelle, $d = 0.697$, rank 143
- Contrôle et diagnostic technique en agriculture, $d = 0.715$, rank 189

From Réalisation de vêtements sur mesure ou en petite série, code B1803

- Retouches en habillement, $d = 0.448$, rank 4
- Stylisme, $d = 0.571$, rank 16
- Patronnage - gradation, $d = 0.574$, rank 18
- Études - modèles en industrie des matériaux souples, $d = 0.575$, rank 19
- Montage de prototype cuir et matériaux souples, $d = 0.636$, rank 41
- Costume et habillage spectacle, $d = 0.666$, rank 79
- Vente en décoration et équipement du foyer, $d = 0.692$, rank 120
- Vente en habillement et accessoires de la personne, $d = 0.698$, rank 129
- Achat vente d'objets d'art, anciens ou d'occasion, $d = 0.725$, rank 191
- Relation commerciale grands comptes et entreprises, $d = 0.782$, rank 309
- Formation professionnelle, $d = 0.795$, rank 344
- Management de magasin de détail, $d = 0.815$, rank 382
- Animation d'activités culturelles ou ludiques, $d = 0.826$, rank 408
- Encadrement technique en insertion professionnelle, $d = 0.872$, rank 478
- Enseignement technique et professionnel, $d = 0.889$, rank 495

From Transaction immobilière, code C1504

- Gestion locative immobilière, $d = 0.445$, rank 2
- Relation commerciale auprès de particuliers, $d = 0.494$, rank 4
- Gérance immobilière, $d = 0.514$, rank 7
- Management de projet immobilier, $d = 0.561$, rank 15
- Relation commerciale grands comptes et entreprises, $d = 0.588$, rank 25

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- Gestion de clientèle bancaire, $d = 0.598$, rank 30

From Vente en habillement et accessoires de la personne, code D1214

- Vente en gros de matériel et équipement, $d = 0.264$, rank 3
- Achat vente d'objets d'art, anciens ou d'occasion, $d = 0.280$, rank 4
- Vente en articles de sport et loisirs, $d = 0.464$, rank 6
- Vente en décoration et équipement du foyer, $d = 0.465$, rank 7
- Optique - lunetterie, $d = 0.507$, rank 10
- Personnel de caisse, $d = 0.508$, rank 11
- Management de magasin de détail, $d = 0.519$, rank 13
- Animation de vente, $d = 0.547$, rank 21
- Management/gestion de rayon produits non alimentaires, $d = 0.585$, rank 27
- Relation commerciale auprès de particuliers, $d = 0.610$, rank 32
- Relation commerciale grands comptes et entreprises, $d = 0.679$, rank 109
- Décoration d'espaces de vente et d'exposition, $d = 0.722$, rank 200

From Communication, code E1103

- Journalisme et information média, $d = 0.465$, rank 6
- Développement et promotion publicitaire, $d = 0.613$, rank 22
- Élaboration de plan média, $d = 0.638$, rank 43
- Promotion d'artistes et de spectacles, $d = 0.743$, rank 181

From Peinture en bâtiment, code F1606

- Montage d'agencements, $d = 0.263$, rank 2
- Réalisation et restauration de façades, $d = 0.284$, rank 5
- Pose de revêtements rigides, $d = 0.286$, rank 6
- Pose de revêtements souples, $d = 0.288$, rank 7
- Maintenance des bâtiments et des locaux, $d = 0.497$, rank 13
- Application et décoration en plâtre, stuc et staff, $d = 0.522$, rank 17
- Entretien d'affichage et mobilier urbain, $d = 0.538$, rank 19
- Direction de chantier du BTP, $d = 0.569$, rank 28
- Vente en décoration et équipement du foyer, $d = 0.661$, rank 118
- Formation professionnelle, $d = 0.701$, rank 195
- Tapisserie - décoration en ameublement, $d = 0.825$, rank 480

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From Personnel de cuisine, code G1602

- Management du personnel de cuisine, $d = 0.229$, rank 3
- Management d'établissement de restauration collective, $d = 0.467$, rank 6
- Charcuterie - traiteur, $d = 0.535$, rank 8
- Café, bar brasserie, $d = 0.536$, rank 9
- Assistance de direction d'hôtel-restaurant, $d = 0.545$, rank 10
- Management d'hôtel-restaurant, $d = 0.567$, rank 15
- Pâtisserie, confiserie, chocolaterie et glacerie, $d = 0.575$, rank 17
- Formation professionnelle, $d = 0.701$, rank 157
- Gestion de structure de loisirs ou d'hébergement touristique, $d = 0.717$, rank 190
- Encadrement technique en insertion professionnelle, $d = 0.733$, rank 228
- Organisation d'événementiel, $d = 0.831$, rank 447

From Opérations manuelles d'assemblage, tri ou emballage, code H3302

- Manutention manuelle de charges, $d = 0.319$, rank 2
- Montage-assemblage mécanique, $d = 0.335$, rank 3
- Conduite d'équipement de conditionnement, $d = 0.335$, rank 4
- Préparation de matières et produits industriels (broyage, mélange, ...), $d = 0.393$, rank 6
- Magasinage et préparation de commandes, $d = 0.501$, rank 13
- Assemblage d'ouvrages en bois, $d = 0.504$, rank 15
- Montage de produits électriques et électroniques, $d = 0.539$, rank 24
- Préfabrication en béton industriel, $d = 0.545$, rank 25
- Revalorisation de produits industriels, $d = 0.546$, rank 26
- Aide agricole de production légumière ou végétale, $d = 0.586$, rank 40
- Aide agricole de production fruitière ou viticole, $d = 0.621$, rank 52
- Conduite de machines d'impression, $d = 0.625$, rank 57
- Façonnage et routage, $d = 0.629$, rank 59
- Maintenance mécanique industrielle, $d = 0.633$, rank 63
- Blanchisserie industrielle, $d = 0.648$, rank 77
- Contrôle en industrie du cuir et du textile, $d = 0.652$, rank 81
- Encadrement d'équipe en industrie de transformation, $d = 0.654$, rank 84
- Décoration d'objets d'art et artisanaux, $d = 0.660$, rank 91
- Mise en forme, repassage et finitions en industrie textile, $d = 0.674$, rank 122

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- Aide d'élevage agricole et aquacole, $d = 0.677$, rank 129
- Préparation de fils, montage de métiers textiles, $d = 0.682$, rank 136
- Préparation et finition d'articles en cuir et matériaux souples, $d = 0.731$, rank 242

From Maintenance des bâtiments et des locaux, code I1203

- Aménagement et entretien des espaces verts, $d = 0.453$, rank 4
- Gardiennage de locaux, $d = 0.486$, rank 6
- Nettoyage de locaux, $d = 0.491$, rank 7
- Peinture en bâtiment, $d = 0.497$, rank 8
- Maintenance électrique, $d = 0.537$, rank 14
- Installation d'équipements sanitaires et thermiques, $d = 0.566$, rank 24
- Entretien d'affichage et mobilier urbain, $d = 0.592$, rank 37
- Électricité bâtiment, $d = 0.612$, rank 53

From Personnel polyvalent des services hospitaliers, code J1301

- Personnel polyvalent d'hôtellerie, $d = 0.436$, rank 8
- Assistance auprès d'enfants, $d = 0.476$, rank 11
- Soins d'hygiène, de confort du patient, $d = 0.500$, rank 14
- Services domestiques, $d = 0.525$, rank 16
- Nettoyage de locaux, $d = 0.533$, rank 18
- Conduite de véhicules sanitaires, $d = 0.645$, rank 99
- Conduite d'opérations funéraires, $d = 0.723$, rank 258
- Hydrothérapie, $d = 0.753$, rank 354

From Assistance auprès d'enfants, code K1303

- Aide en puériculture, $d = 0.403$, rank 2
- Services domestiques, $d = 0.410$, rank 4
- Éducation de jeunes enfants, $d = 0.416$, rank 5
- Assistance auprès d'adultes, $d = 0.472$, rank 6
- Personnel polyvalent des services hospitaliers, $d = 0.476$, rank 7
- Animation de loisirs auprès d'enfants ou d'adolescents, $d = 0.484$, rank 8
- Soins d'hygiène, de confort du patient, $d = 0.577$, rank 18
- Assistance médico-technique, $d = 0.607$, rank 32
- Personnel polyvalent d'hôtellerie, $d = 0.623$, rank 40

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From Musique et chant, code L1202

- Enseignement artistique, $d = 0.462$, rank 2
- Animation d'activités culturelles ou ludiques, $d = 0.596$, rank 14
- Art dramatique, $d = 0.616$, rank 19
- Promotion d'artistes et de spectacles, $d = 0.641$, rank 32
- Enseignement des écoles, $d = 0.647$, rank 37
- Direction d'établissement et d'enseignement, $d = 0.656$, rank 45
- Enseignement général du second degré, $d = 0.657$, rank 46
- Animation musicale et scénique, $d = 0.733$, rank 122

From Secrétariat, code M1607

- Assistanat de direction, $d = 0.238$, rank 3
- Assistanat technique et administratif, $d = 0.270$, rank 4
- Secrétariat comptable, $d = 0.352$, rank 6
- Secrétariat et assistanat médical ou médico-social, $d = 0.394$, rank 7
- Assistanat commercial, $d = 0.412$, rank 8
- Collaboration juridique, $d = 0.508$, rank 12
- Gestion locative immobilière, $d = 0.557$, rank 14
- Formation professionnelle, $d = 0.675$, rank 113

From Magasinage et préparation de commandes, code N1103

- Intervention technique d'exploitation logistique, $d = 0.356$, rank 2
- Conduite d'engins de déplacement des charges, $d = 0.361$, rank 3
- Manutention manuelle de charges, $d = 0.378$, rank 4
- Vente en gros de matériel et équipement, $d = 0.494$, rank 6

Opérations manuelles d'assemblage, tri ou emballage, $d = 0.501$, rank 7

- Préparation de matières et produits industriels (broyage, mélange, ...), $d = 0.534$, rank 11
- Conduite et livraison par tournées sur courte distance, $d = 0.540$, rank 14
- Blanchisserie industrielle, $d = 0.555$, rank 16
- Conduite d'équipement de conditionnement, $d = 0.601$, rank 28
- Mise en rayon libre-service, $d = 0.601$, rank 29
- Façonnage et routage, $d = 0.683$, rank 111
- Exploitation des pistes aéroportuaires, $d = 0.887$, rank 496

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S4 – Mobilités proches selon notre distance mais absentes de ROME V3

From Aménagement et entretien des espaces verts, code A1203

- Entretien et surveillance du tracé routier, $d = 0.440$, rank 2
- Maintenance des bâtiments et des locaux, $d = 0.453$, rank 4
- Création en arts plastiques, $d = 0.461$, rank 5

From Réalisation de vêtements sur mesure ou en petite série, code B1803

- Assemblage - montage de vêtements et produits textiles, $d = 0.251$, rank 1
- Tapisserie - décoration en ameublement, $d = 0.352$, rank 2
- Coupe cuir, textile et matériaux souples, $d = 0.473$, rank 4
- Assemblage - montage d'articles en cuirs, peaux, $d = 0.478$, rank 5

From Transaction immobilière, code C1504

- Téléconseil et télévente, $d = 0.472$, rank 2
- Assistanat commercial, $d = 0.504$, rank 4
- Assistance et support technique client, $d = 0.511$, rank 5

From Vente en habillement et accessoires de la personne, code D1214

- Nettoyage d'articles textiles ou cuirs, $d = 0.056$, rank 1
- Coiffure, $d = 0.446$, rank 4

From Communication, code E1103

- Marketing, $d = 0.270$, rank 1
- Conception de contenus multimédias, $d = 0.395$, rank 2
- Animation de site multimédia, $d = 0.419$, rank 3
- Organisation d'évènementiel, $d = 0.439$, rank 4

From Peinture en bâtiment, code F1606

- Montage de réseaux électriques et télécoms, $d = 0.267$, rank 2
- Installation d'équipements sanitaires et thermiques, $d = 0.281$, rank 3

From Personnel de cuisine, code G1602

- Plonge en restauration, $d = 0.012$, rank 1
- Fabrication de crêpes ou pizzas, $d = 0.362$, rank 3
- Personnel polyvalent en restauration, $d = 0.420$, rank 4

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From Opérations manuelles d'assemblage, tri ou emballage, code H3302

- Conduite d'équipement de production alimentaire, $d = 0.353$, rank 4

From Maintenance des bâtiments et des locaux, code I1203

- Entretien et surveillance du tracé routier, $d = 0.382$, rank 1
- Entretien des espaces naturels, $d = 0.414$, rank 2
- Nettoyage des espaces urbains, $d = 0.486$, rank 4

From Personnel polyvalent des services hospitaliers, code J1301

- Aide en puériculture, $d = 0.319$, rank 1
- Assistance médico-technique, $d = 0.343$, rank 2
- Préparation en pharmacie, $d = 0.350$, rank 3
- Imagerie médicale, $d = 0.394$, rank 4
- Analyses médicales, $d = 0.413$, rank 5

From Assistance auprès d'enfants, code K1303

- Accompagnement médicosocial, $d = 0.409$, rank 2

From Musique et chant, code L1202

- Biologie médicale, $d = 0.512$, rank 2
- Kinésithérapie, $d = 0.519$, rank 3
- Gestion des opérations de circulation internationale des marchandises, $d = 0.523$, rank 4
- Danse, $d = 0.534$, rank 5

From Secrétariat, code M1607

- Opérations administratives, $d = 0.184$, rank 1
- Accueil et renseignements, $d = 0.278$, rank 4

From Magasinage et préparation de commandes, code N1103

- Intervention technique d'exploitation des transports routiers de marchandises, $d = 0.493$, rank 4