CLAIMS

WHAT IS CLAIMED IS:

1. Use of an anti-TNF therapy in the manufacture of a medicament for treating an autoimmune disorder in a subject, wherein the anti-TNF therapy is to be administered to the subject,

wherein the subject has been determined to be responsive via a classifier established to distinguish between responsive and non-responsive prior subjects in a cohort that have received the anti-TNF therapy,

wherein the classifier is developed by assessing:

one or more genes whose expression levels significantly correlate to clinical responsiveness or non-responsiveness; and

at least one of:

presence of one or more single nucleotide polymorphisms (SNPs) in an expressed sequence of the one or more genes; or

at least one clinical characteristic of the responsive and non-responsive prior subjects,

wherein the classifier is validated by an independent cohort different than the cohort who have received the anti-TNF therapy, and

wherein the one or more genes comprise: ALPL, ATRAID, BCL6, CDK11A, CFLAR, COMMD5, GOLGA1, IL1B, IMPDH2, JAK3, KLHDC3, LIMK2, NOD2, NOTCH1, SPINT2, SPON2, STOML2, TRIM25, or ZFP36.

2. The use of claim 1, wherein the subject has been previously administered the anti-TNF therapy.

3. The use of claim 2, wherein the subject has been administered the anti-TNF therapy at least one, at least two, at least three, at least four, at least five, or at least six months prior to said administration.

4. The use of claim 3, wherein the previously administered anti-TNF therapy is different to the anti-TNF therapy being administered responsive to said classifier.

5. The use of claim 1, wherein the classifier identifies 60% or greater of non-responders within a treatment-naive cohort.

6. The use of claim 5, wherein the classifier identifies 60% or greater of non-responders within a treatment-naive cohort of at least 350 subjects.

7. The use of claim 1, wherein the one or more genes are characterized by their topological properties when mapped on a human interactome map.

8. The use of claim 1, wherein the SNPs are identified in reference to a human genome.

9. The use of claim 1, wherein the one or more genes comprise: ALPL, BCL6, CDK11A, CFLAR, IL1B, JAK3, LIMK2, NOD2, NOTCH1, TRIM25, or ZFP36.

10. The use of claim 1, wherein the at least one clinical characteristic is selected from: body-mass index (BMI), gender, age, race, previous therapy treatment, disease duration, C-reactive protein level, presence of anti-cyclic citrullinated peptide, presence of rheumatoid factor, patient global assessment, treatment response rate (e.g., ACR20, ACR50, ACR70), and combinations thereof.

11. The use of claim 1, wherein the anti-TNF therapy comprises infliximab, adalimumab, etanercept, certolizumab pegol, golimumab, or biosimilars thereof.

12. The use of claim 1, wherein the autoimmune disorder is selected from rheumatoid arthritis (RA), psoriatic arthritis, ankylosing spondylitis, Crohn's disease (CD), ulcerative colitis (UC), chronic psoriasis, hidradenitis suppurativa, multiple sclerosis, and juvenile idiopathic arthritis.

13. The use of claim 1, wherein the classifier is established using microarray analysis derived from the responsive and non-responsive prior subjects.

14. The use of claim 1, wherein the SNPs are selected from chr1.161644258, chr1.2523811, chr11.107967350, chr17.38031857, chr7.128580042, rs10774624, rs10985070, rs11889341, rs1571878, rs1633360, rs17668708, rs1877030, rs1893592, rs1980422, rs2228145, rs2233424, rs2236668, rs2301888, rs2476601, rs3087243, rs3218251, rs331463, rs34536443, rs34695944, rs4239702, rs4272, rs45475795, rs508970, rs5987194, rs657075, rs6715284, rs706778, rs72634030, rs73013527, rs73194058, rs773125, rs7752903, rs8083786, and rs9653442.

15. The use of claim 1, wherein response is validated in subjects by statistical analysis of clinical features.

16. The use of claim 15, wherein the statistical analysis of clinical features analyzes changes in clinical characteristics after receiving anti-TNF therapy.

17. The use of claim 15, wherein the statistical analysis of clinical features analyzes changes of one or more of ACR50, ACR70, CDAI LDA, CDAI remission, DAS28-CRP LDA, or DAS28-CRP remission.

18. The use of claim 15, wherein the statistical analysis is a Monte Carlo analysis.

19. The use of claim 1, wherein the classifier comprises all of the following genes and clinical characteristics: ALPL, ATRAID, BCL6, CDK11A, CFLAR, COMMD5, GOLGA1, IL1B, IMPDH2, JAK3, KLHDC3, LIMK2, NOD2, NOTCH1, SPINT2, SPON2, STOML2, TRIM25, ZFP36, BMI, Sex, Patient Global, Assessment, and Anti-CCP.

20. The use of claim 1, wherein the subject is determined to be responsive by an automated, computer-implemented method.

21. A non-transitory computer-readable storage media encoded with a computer program including instructions executable by at least one processor to create an improved sample classification application comprising:

at least a classifier stored on the media, wherein the classifier is capable of distinguishing between a responsive and a non-responsive subject for anti-TNF therapy,

wherein the classifier is developed by assessing:

one or more genes whose expression levels significantly correlate to clinical responsiveness or non-responsiveness to anti-TNF therapy; and

at least one of:

presence of one or more single nucleotide polymorphisms (SNPs) in an expressed sequence of the one or more genes; or

at least one clinical characteristic of the responsive and non-responsive prior subjects,

wherein the classifier is validated by an independent cohort than the cohort who have received the anti-TNF therapy, and

wherein the one or more genes comprise: ALPL, ATRAID, BCL6, CDK11A, CFLAR, COMMD5, GOLGA1, IL1B, IMPDH2, JAK3, KLHDC3, LIMK2, NOD2, NOTCH1, SPINT2, SPON2, STOML2, TRIM25, or ZFP36.

22. The non-transitory computer-readable storage media of claim 21, further comprising a software module configured to receive gene expression data derived from a blood sample from a subject.

23. The non-transitory computer-readable storage media of claim 22, further comprising a software module for applying the classifier to the gene expression data.

24. The non-transitory computer-readable storage media of claim 23, further comprising a software module for using the classifier to output a classification for the sample, wherein the classification classifies the blood sample as being from a subject that is responsive or non-responsive to anti-TNF therapy.

25. The non-transitory computer-readable storage media of claim 21, wherein the subject has been previously administered the anti-TNF therapy.

26. The non-transitory computer-readable storage media of claim 25, wherein the subject has been administered the anti-TNF therapy at least one, at least two, at least three, at least four, at least five, or at least six months prior to said administering.

27. The non-transitory computer-readable storage media of claim 21, wherein the classifier identifies 60% or greater of non-responders within a treatment-naive cohort.

28. The non-transitory computer-readable storage media of claim 27, wherein the classifier identifies 60% or greater of non-responders within a treatment-naive cohort of at least 350 subjects.

29. The non-transitory computer-readable storage media of claim 21, wherein the one or more genes are characterized by their topological properties when mapped on a human interactome map.

30. The non-transitory computer-readable storage media of claim 21, wherein the SNPs are identified in reference to a human genome.

31. The non-transitory computer-readable storage media of claim 21, wherein the one or more genes comprise: ALPL, BCL6, CDK11A, CFLAR, IL1B, JAK3, LIMK2, NOD2, NOTCH1, TRIM25, or ZFP36.

32. The non-transitory computer-readable storage media of claim 21, wherein the at least one clinical characteristic is selected from: body-mass index (BMI), gender, age, race, previous therapy treatment, disease duration, C-reactive protein level, presence of anti-cyclic citrullinated peptide, presence of rheumatoid factor, patient global assessment, treatment response rate (e.g., ACR20, ACR50, ACR70), and combinations thereof.

33. The non-transitory computer-readable storage media of claim 21, wherein the anti-TNF therapy comprises administration of infliximab, adalimumab, etanercept, certolizumab pegol, golimumab, or biosimilars thereof.

34. The non-transitory computer-readable storage media of claim 21, wherein the classifier is established using microarray analysis derived from the responsive and non-responsive prior subjects.

35. The non-transitory computer-readable storage media of claim 21, wherein the SNPs are selected from chr1.161644258, chr1.2523811, chr11.107967350, chr17.38031857, chr7.128580042, rs10774624, rs10985070, rs11889341, rs1571878, rs1633360, rs17668708, rs1877030, rs1893592, rs1980422, rs2228145, rs2233424, rs2236668, rs2301888, rs2476601, rs3087243, rs3218251, rs331463, rs34536443, rs34695944, rs4239702, rs4272, rs45475795, rs508970, rs5987194, rs657075, rs6715284, rs706778, rs72634030, rs73013527, rs73194058, rs773125, rs7752903, rs8083786, and rs9653442.

36. The non-transitory computer-readable storage media of claim 21, wherein response is validated in subjects by statistical analysis of clinical features.

37. The non-transitory computer-readable storage media of claim 36, wherein the statistical analysis of clinical features analyzes changes in clinical characteristics after receiving anti-TNF therapy.

38. The non-transitory computer-readable storage media of claim 36, wherein the statistical analysis of clinical features analyzes changes of one or more of ACR20, ACR50, ACR70, CDAI LDA, CDAI remission, DAS28-CRP LDA, or DAS28-CRP remission.

39. The non-transitory computer-readable storage media of claim 36, wherein the statistical analysis is a Monte Carlo analysis.

40. The non-transitory computer-readable storage media of claim 21, wherein the classifier comprises any of the following genes or clinical characteristics: ALPL, ATRAID, BCL6, CDK11A, CFLAR, COMMD5, GOLGA1, IL1B, IMPDH2, JAK3, KLHDC3, LIMK2, NOD2, NOTCH1, SPINT2, SPON2, STOML2, TRIM25, ZFP36, BMI, Sex, Patient Global, Assessment, or Anti-CCP.

41. A kit comprising the non-transitory computer-readable storage media of claim 21.

42. The kit of claim 41, further comprising instructions describing how to execute said classifier.